133 "golets"), which means the same as "baldy" or "bald-head." These goltsy, which appear in Transbaykal only in individual instances, are extremely typical for all mountain areas in the Far Eastern region.

101 311 Culturally, too, Transbaykal has to a remarkable degree a transitional character. The steppe regions, the steppe valleys, and the steppe islands have since time immemorial been the seat of nomadic cattle-breeders, in this case the Buryat, an intelligent and energetic tribe of Mongols, who have kept themselves on the steppes which suit their nature and culture. It is interesting to determine how exactly their expansion even today coincides with their natural landscape. The Buryat penetrate only rarely into the forest areas; more often they leave these to the forest peoples of the Tungus, who even today live there still as hunters and reindeer breeders. The Buryat were the first people to give successful resistance for a time to the invading Cossacks, but as nomads they later had to clear the field for the Russians who were seeping in slowly and pursuing agriculture. Buryat helped themselves, however, by adjusting: they often went over to agriculture themselves, and they appropriated for themselves the advantages of Russian culture. Thus, even though they were penetrated by Russians, they were able to retain their original regions and to attain a cultural level which raised them above all their Mongolian tribal brothers on the other side of the Soviet Russian border. Because of the invasion by the Russians, there came into existence here a cultivated landscape which was inserted between the completely forested areas in the north and the pure steppes in the south; but corresponding to the spacious transition region, this cultivated landscape did not appear in a closed-off zone, but in culture islands. In extensive regions in the south near the border, the Buryat even today still lead their old nomadic, cattle-breeding life.

• 132 The fact that the bulk of the rainfall occurs in the summer is favorable for agriculture. Chita, lying in the middle of the land, has an annual rainfall of only 319 millimeters. However, 289 millimeters of this falls during the vegetation period so that a relatively sufficient [243] amount of dampness is available, in conjunction with continental warmth, to make possible a very high yield of summer wheat. This makes Transbaykal an important wheat producer and the principal supplier for all of east Siberia.

133 The Amur country is adjacent to Transbaykal, without a clear border, north of the northern arc of the Amur. In its large morphological traits it is no less varied than Transbaykal, though the differences in

height are greater; for in the Amur country the bottoms of the valleys sink to between 500 and 200 meters, while the mountain ridges still retain heights between 1,000 and 1,500 meters. The number of mountain ridges, which retain their rounded-off, plateau-like character with numerous "gol'tsy" /29/ set on them, decreases. Likewise there disappears the parallel lining up of the main chains in a northeastern direction, a trait which is so marked in Transbaykal. The main mountain chains in the Amur country, on the contrary, run predominantly from west to east, while others cross them almost at right angles. Thus, in contrast to Transbaykal, the geological features have greater dimensions here, where broad plains are inserted between the individual mountain chains, and toward the Amur these plains assume the character of low plains. The thickly settled Zeya-Bureya Plain should be mentioned first. But here too the corresponding traits appear which--apart from the mountains--are expressed in the main direction of the rivers and their valleys. A southwest-northeast direction (like Lake Baykal), such as occurs in the course of the Argun, the Selemdzha, the Bureya, and the lower course of the Amur, crosses a northwest-southeast direction, which appears most clearly in the middle course of the Amur and in the direction of the Gilyuy. Many rivers, such as the Zeya, follow first one direction and then the other. 133

The difference in the landscape from Transbaykal is great since the Pacific Ocean has a powerful effect on the Amur country which lies in the sphere of the east Asiatic monsoon. The nearness of the great continental mass, to be sure, brings harsh winters; but the summer is warm and brings at the same time heavier rainfall than in Transbaykal. Generally the annual rainfall is more than 500 millimeters, of which usually more than half falls in the three summer months of June, July, and August alone and brings forth a most luxurious plant growth. While in Transbaykal the valley areas remain free of tree growth because of the dryness, here there is excessive dampness, which makes it impossible for forests to thrive in the valleys, meadows and level areas. This excess of summer rain gives the landscape its special stamp. Swampy reed thickets along the rivers, broad meadowlands covered with high grass and lying on the higher plains, giving way to little woods on the dry hills, and on the slopes and ridges of the high mountain chains forest thickets often difficult to penetrate and, in contrast to the Siberian taiga, containing oaks and deciduous trees--these are typical of the entire Amur country. 132 137

The excess of dampness in vegetation season is a handicap 000

311 The excess of dampness in vegetation season is a handicap even for agriculture and makes difficult the extension of the cultivated areas. New land for cultivation must as a rule be won laboriously from nature by drying it out. More and more the extended Zeya-Bureya Plain and the area along the Amur have become quite thickly settled, and large parts of the famous "Amur [162] Prairie" have been transformed into cultivated land. It is predominantly Russians who live here. The Chinese who immigrated here earlier have been pushed back over the Amur--in part by force. In all the rest of the area, however, /30/ untamed nature dominates the landscape, which is traversed at most by a few Tungus or Russian 316 hunters. A wealth of gold has lured numerous Russians into this wasteland, too, especially in the area around the upper courses of the left tributaries of the Amur. A locally very active gold industry has come into existence, which today is organized by the state and which has drawn even this distant region into the economy.

133 The Ussuri country is divided into two completely different parts: the huge mountain mass of the Sikhote-Alin', which fills the entire area from the Bay of Peter the Great in the south to the mouth of the Amur in the north; and the Ussuri-Khanka lowlands, which extend west of the Sikhote-Alin' in the same direction and continue south of the Khanka Lake without marked interruption as far as the Bay of Peter the Great.

The Sikhote-Alin' is a forest-covered, strongly valleyed /zertaltes/ mountain mass, which is divided into several ridges running parallel to the coast. The shapes of the mountains are soft without especially marked edges and projections. More often plateau-like shapes predominate here, too. The heights in general lie between 650 and 850 meters; the valleys, however, are deeply carved out. Rising slowly from the west, the mountain mass descends steeply to the sea and only rarely leaves free a narrow coastal indentation plain on which there arises small, poverty-stricken fishing villages. The nearness of the sea crossed by a cold stream causes a cool, foggy, rainy, unfriendly summer, thus producing similar conditions to those found on the entire coast extending to the north beyond Okhotsk. Swampy valleys and forests dripping with a cool dampness and with a more northern stamp are typical marks of this area.

●132 The western side of the Sikhote-Alin' and the Ussuri-Khanka lowlands, on the other hand, correspond more to the Amur 137 country. Warm to hot summers joined with high rainfall and a

strong inclination to marshiness are distinguishing marks for this area. 132. 137.
The Sikhote-Alin' stretching parallel to the coast keeps back the coolness and also the fog from the sea and allows the sun to have a stronger effect. Everywhere the more southerly position makes itself apparent. In the forests of Sikhote-Alin' deciduous trees appear more and more in the foreground, increasing toward the south, until finally, in magnificent specimens, they form the sole type of tree. In the cultivated zone, too, which stretches along the entire lowlands, 311
typically Manchurian-Chinese plants become noticeable in increasing [241]
measure toward the south. Kaoliang and other millet, soya beans, and rice appear noticeably on the scene. There is a change in the 162
population, too. In the northern part of the lowlands, as far as Khanka Lake, Russians and Ukranians predominate; in the extreme south, Chinese and Koreans are in the majority. The Ussuri-Khanka lowland is relatively thickly settled, the Sikhote-Alin' itself, on the [316]
contrary, is in large areas as good as uninhabited, except for some mining areas in the south, where /31/ coal primarily is mined. Native Tungus traverse the Sikhote-Alin' in smaller numbers than in the old days, and in addition there are Russian hunters and Chinese collectors, who are looking for secret, legendary plants.

Sakhalin Island stretches over 950 kilometers in a meridional 131
direction. The southern part is traversed by two parallel mountain ridges, which are separated from one another by a relatively wide depression. The eastern mountain chain is shorter but higher, and its peak of 2,013 meters is the highest elevation on the island. Toward the north the mountain ridges flatten out and give way to a hilly plain. The cool, foggy air masses blow unhampered over the land here, while in the south a difference in climate is caused by the mountain chains. The eastern slopes are cool, rainy and unfriendly, while the western side appears somewhat milder. The southern parts of the island, which were Japanese from 1905 to 1945 and only now have again become Russian , are generally more favorable. In terms of its landscape, Sakhalin can be designated a damp, cool, forested mountain country, but in numerous places treeless moss steppes appear, which recall the tundras of the north. Once feared as a Russian prisoners' colony, Sakhalin is advancing economically more and more because of its petroleum and coal resources.

The Okhotsk coastal area begins at the Uda Bay and encom- 133
passes, in a narrow coastal strip, the Sea of Okhotsk as far as Penzhina Bay in the extreme northeast. In the western part, which stretches

Remarkably enough the valley of the Upper Angara, which 133
stretches far to the east between glaciated mountain ranges (Upper Angara Range in the north, the Barguzin Range in the south) was not exposed to glaciation.

Also south of Lake Baykal the mountain ranges had glaciers, which in the valley of the Slyudyanka and Pokhabikha reached the level of Lake Baykal in the form of valley glaciers. Here more than 25 glaciers have been counted in an area of 60 square kilometers, but these were all only insignificant ones which at most had a length of 10 kilometers. The landscape is rich in gorges, which lie at very different heights ranging from 50 meters to 600 meters above the present level of Lake Baykal (454 meters above sea level). Thus the Ice Age snow boundary must have been very low here in comparison with the neighboring Sayan (around 2,000 meters) and the northeastern Baykal area (at least 1,200 meters). An explanation for this striking appearance can be seen in the fact that Lake Baykal itself even in the Ice Age /51/ exerted an influence on the climate of the surrounding areas, an influence which was especially noticeable here in the southern part where even today the rainfall is high. The slope of the Khamar-Daban turned toward Lake Baykal is the rainiest area in Transbaykal. But in addition there is the fact that southern Lake Baykal is an area of recent depression, which continues even today, and accordingly the traces of the glaciers can also be regarded as subsequently dislocated.

There are also local glaciations in Transbaykal apart from the above-described glaciated areas. The best known are the glaciations of the 2,500 meter high Sokhondo and neighboring mountains, where gorges, trough valleys, and even moraines appear on the slopes.

Traces of an old glaciation have also been found in the Dzhugdzhur, in the Stanovoy, which extends up to 2,482 meters in height, in the Tukuringra Range in the heights on both sides of the Zeya break-through, and in the Yam-Alin (2,215 meters). However, the signs are but slight throughout and appear only in a limited area, and accordingly here there were at most individual dotted glacier formations.

The Permafrost and Its Significance

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The largest part of the Soviet Russian Far Eastern region lies in the sphere of the permafrost or the Eternally Frozen Earth, as this

appearance of nature is also named, and this therefore deserves special treatment within this work. The Soviet government has specially undertaken research on this phenomenon,[1] which is typical of the largest part of Siberia and also for parts of the European north; the government has erected eight permanent research stations for this purpose, of which four are in the regions being discussed: namely, in Petrovsk (Transbaykal), Skovorodino on the railroad line north of the northern arc of the Amur, Bomnak in the trough depression of the upper Zeya, and in Anadyr'. In addition to B. Shostakovich, M. Sumgin especially has done great service in research on permafrost. Orientation on the extent of the permafrost is given in the attached sketch map, which is based on Russian sources. This map shows that the only areas completely free from frozen ground are the areas on both sides of and between the Zeya and Bureya rivers and perhaps the area east of the Bureya Mountain Range, including the entire Ussuri country and the Maritime Krai. Frozen earth is not found in the larger southern part of Kamchatka and on Sakhalin Island either.

In the areas which are dominated by permafrost, the ground thaws in the summertime only superficially in a layer whose thickness varies considerably with the locale, and under this layer lies the permafrost, i.e. a constantly frozen layer of earth, which likewise is of varying thickness. The upper layer which thaws in the summer, is called "active" (deiatel'nyi sloi) /52/ by the Russians, and only it is the bearer of organic life. In the majority of cases the pieces of earth in the permafrost area are so strongly cemented together by ice that the ground gives way only under the blows of a crowbar. However, this sign of linking together by ice must not be used as the sole means of determining whether the ground should be classed as eternally frozen; rather this classification depends above all on the temperature. Thick rock can also bear permafrost, although no external changes can be discovered on the rock.

In the winter the ground freezes from the surface down. In many cases, then, the winter freeze and the permafrost grow together into one unit, but in most cases there remains between the two an unfrozen horizon, whose water under special morphological conditions, especially at the foot of slopes, breaks through the upper frozen layer or is pressed out by the pressure from above of the frozen earth. This leads to formations of ice on top of the ice (Naled'), which, since the water flowing out freezes again and again, can often extend over a large area and can attain a thickness of more than one, indeed of two meters.

[1] [i.e. permafrost -- Analyst]

Or, under specific conditions, ice kernels form within the earth. These ice kernels grow and press the upper layers of the earth into a hill, which then in the warm season collapses again. As a result a lake is frequently formed in place of the hill because of break-throughs in the earth. Generally the existence of frozen earth permits the absorption of the surface water only to a certain depth, and accordingly the rainfall for the most part must flow off on the surface. The irregular water flow of the rivers in these regions often goes back to this phenomenon. Thus the contrast between the high and low water lines is very great everywhere. At the confluence of the Shilka and the Agrun, the Amur passes, as its annual mean 1,200 cubic meters of water per second, while the minimum during the year is only 125 cubic meters per second. Heavier rainfall makes itself felt immediately in an often flood-like rise in the water being passed in the rivers. The thawing of the surface layers of the earth, especially in areas with varying morphological formations, offers the best conditions for ground flows. Thus the domain of the permafrost is the classical land for landslides and solifuction.

But, in addition to these numerous and very interesting natural phenomena, the effects of the permafrost on man and his economy must be mentioned; these effects are apparent everywhere in the permafrost domain and often bring difficulties. Through freezing the volume of the water expands, presses the ground upward in places, and causes destruction of transportation installations. Deep tears occur in the railroad line, and through these tears mud and water from deeper layers often push out, /53/ /Mapof the permafrost area:/ /54/ freezes on the surface, bursts the splits open farther, and forms high bucklings, and thus gradually the roads become unusable. With the setting in of the thawing weather, everything sinks together in mud and pulp.

In addition the roads and especially the bridges are by preference the starting points for ice building on ice. As an example Sumgin points out the road built from Bol'shoy Never on the Amur railroad, via Tyndinskiy and the Aldan gold region, to Yakutsk on the Lena. This road should be usable for trucks the entire year. Out of the entire length of 1,300 kilometer, on the southern part alone between Bol'shoy Never and Tommot, which is 728 kilometers long, 117 formations of ice on top of ice were counted in the winter of 1927-28. These formations caused serious destruction, especially on bridges which were as a result partially raised up, made crooked, and gradually

Map of the Permafrost Area: /53/

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Areas with Ground Temperatures in Celcius Degrees at a Depth of 10-15 Meters:

Under - 5°
Closed-off area of frozen ground.

Predominantly - 5° to - 1.5°
Frozen earth less thick
Islands here and there where the ground is not frozen.

(Captions continued on following page)

/53/

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Predominantly over - 1.5°

In the north predominantly frozen earth with islands where the ground is not frozen. In the south for the most part the ground is not frozen butthere are islands where it is.

Predominantly over - 1.5°

Only in places are there islands where the ground is frozen

132 made unusable. In the spring after the melting away of the ice, the
134 bridges completely collapse. The population claims that earlier for-
499 mations of ice on ice occurred only seldom in these same regions. Thus it must be assumed, and Sumgin also points this out, that the formations of ice on ice are encouraged by the building of roads. Through trials and experience, various new methods of road-building have been found which hinder this damage, but it can not be entirely eliminated. In general terms it can be said that in the areas of permafrost road-building is very difficult, requires a longer time, and is done at much greater cost than in other regions.

Of a similar type are the difficulties encountered in building and maintaining railroad lines. In addition to the pulsation of the earth, landslides and solifluction are regarded as being especially dangerous here. In building the Amur railroad line all these hindrances and difficulties became known in detail. Often, without regard to the cost, the lines had to be laid entirely differently from what had originally been planned. Especial difficulty was encountered in providing water for the railroad in the winter in the areas of permafrost. Water had to be drilled from layers which lay under the permafrost. In many places water had to be procured in kilometer-long, heated conduits. A comparison of costs shows best how great the difficulties were in building the Amur railroad line in the areas of permafrost and to what extent these difficulties increased the costs here versus those in other regions. The building of the great Siberian Railroad (as far as Sretensk in Transbaykal), including all preparatory work, required as a mean an expenditure of 67,737 rubles per verst, while the western part of the Amur line from Kuenga to Kerak, whose total lenght is 597 verst, required for pure building costs an average expenditure of 158,000 rubles per verst. Also the maintenance of the railroads requires larger outlays, since the railroad lines, and especially the bridges, require constant and very careful inspection, in order to be able to take /55/ protective measures in time at the slightest sign of any destruction whatsoever. Thus in the course of the year position changes were determined on 50 out of a total of 80 bridges on the Amur railroad, and these position changes had to be eliminated by protection and rebuilding measures.

132 The permafrost also plays a noteworthy role in the method
134 of construction. Apart from the direct effects of the cold, the buildings
342 in the sphere of the permafrost are subjected to the danger of gradual decay. The reason for this lies principally in the fact that the ground

under a building freezes little if at all during the winter. V.G. Petrov (154) writes on this subject: "The house stands as though on

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154. Petrov, V.G. Naledi na Amursko-Iakutskoi magistrali /Formations Breaking Through the Ice (Aufeisbildungen) in the Amur-Yakutsk Magistracy/. Academy of Science, Moscow, 1930.

the edge of a frozen crust. If now this crust begins to thaw, its edge spreads the house lengthwise and widthwise, and the damage begins." This leads to general deformation of the house and to the gradually sinking in of the house into the ground. Sumgin points out that this danger is caused above all by so-called "swimming" masses, which form under the house and which can be traced back to the changes in the thermic conditions in the ground. With larger structures of several stories, they can often be caused by the pressure of the structure alone. In individual cases it happens that the water in the earth, which lies between the winter freeze and the permafrost and which is under a certain pressure, finds a way into the open underneath the house. It penetrates into the cellar and even into the living quarters and forces the occupants to leave the house. Not uncommonly the penetration of the water occurs so quickly that the occupants do not succeed in rescuing all their possessions from the rooms. The regions of permafrost require construction methods which counteract these dangers. As a rule an attempt is made to lay the foundation so deeply that it has a firm position in the permafrost; to do this, mostly wood or reinforced concrete palings are inserted into prepared holes deep in the permafrost. In the construction of new cities and plants the question of a sufficient and secure foundation plays an important role, and it also is an important factor in the cost estimate. In building the city of Magadan, where apartment buildings with up to six stories were erected, thick layers of earth had to be removed in order to install the foundations so that the foundations became frozen fast into the ground. The sides of the foundations were protected by insulating layers. Often the foundations were entirely embedded in insulating layers here. In order to eliminate all these difficulties, M.M. Kryllov, whom Sumgin cites, had drawn up a plan to be carried out with the help of modern cold technology; this plan envisaged keeping the ground within the construction installations always under a certain temperature with the goal either of preserving the permafrost at a certain depth or even of raising it. However, this proposal has been tried out but little in practice.

000 even of raising it. However, this proposal has been tried out but little in practice.

●132 134 312 /56/ In addition to the general water supply, the supplying of drinking water in the permafrost regions in winter causes many difficulties, especially for larger settlements. Since many rivers freeze to the ground, the water must often be gotten from far away. In many places artificially caused formations of ice on top of ice are used to help in smaller settlements. But it would lead us too far astray to go into detail here on the various and often also unique methods of procuring water.

132 134 316 The permafrost is also of great importance in connection with mining and with the extractions of natural resources generally. In pit mining the permafrost sets great hardness against the invasion of man. Even diamond drills fail sometimes, and, if the motor stops for even a moment, the drill freezes fast in the water of the hole being drilled. The pits and galleries are mostly firm and hold even without supporting beams, the danger of chokedamp is slight, and also ground water seldom appears, and only occasionally do water break-ins occur. In open mining the permafrost must be dynamited, but then the blocks knocked loose turn into bulky pulp. Gold extraction has to overcome special difficulties in the working of gold wash-works which mostly are in the permafrost and lie under a thick, unfrozen layer of earth which can be removed rather easily. In the most important gold regions the most modern machinery is employed to process the gold-bearing sand in one vein with everything from dredge to dressing-floor, but all these technically complete establishments conduct a difficult battle with the permafrost, whose hardness gives extraordinary resistance. The natural thawing under the air temperature of the summer proceeds so slowly that man must help it along. The primitive thawing with the aid of wood and coal fires has disappeared, and jets of water also do not suffice here. At present, steam is employed everywhere, and new announcements report that the use of electricity is being considered for the future.

132 134 The role played by permafrost in connection with vegetation is many sided, but the mutual relationships are still too little clarified. For the agrarian economy the permafrost is a more favorable factor as a source of ground dampness, especially in the interior which suffers from a shortage of summer rainfall. Here the dampness of the ground is a natural compensation. It is due to the exploitation of these favorable conditions that Soviet Russia has succeeded in spreading agriculture,

if not in large areas, yet sporadically toward the Polar Circle, where cultivated areas are to be found to a greater or lesser extent near all settlements as far as north of Magadan. These cultivated areas serve as a source of local supply. 132 134

/57/ The Climatic Conditions

The climatic conditions are determined by the seasonally changing contrast of the barischen /baric?/ relationship between continent and ocean. In winter dry air masses flow toward the ocean; the summer sea wind on the other hand brings dampness into the land. Accordingly the influence of the ocean is limited to the true Far Eastern regions whose waters empty into the Pacific. These regions accordingly form a climatic unit. As a consequence of the regular seasonal climate changes, these regions belong to the East Asiatic monsoon area, whose typical character is clearly stamped everywhere and has its effect as far north as beyond 60° latitude. Only Transbaykal lies outside of this unit. Its inland location allows the continental traits to appear much more sharply. But the summer monsoon also makes itself felt here as far as the Yablonovyy Mountain Range. 132

The following climate areas in addition to Transbaykal can be differentiated according to their general character: the Amur-Ussuri area, the southern coastal region, in which Sakhalin is also included, the northern coastal region including Kamchatka Peninsula, and the Anadyr' region. The important distinguishing features are included in the following chart:

Area	Annual Rainfall in millimeters	Number of months with a mean over		Annual Temperature Variation
		5°	10°	
Transbaykal	200 - 340	5	3	42° - 52°
Amur-Ussuri Region	525 - 620	5	5	42° - 48°
Southern Coast	540 - 760	6	4	30° - 34°
Sakhalin	500 - 750	5	4	28° - 35°
Northern Coast	300 - 900	4	2	33° - 37°
Kamchatka	500 -1,000	4	2	23° - 32°
Anadyr'	190 - 200	3	3	40° - 45°

Transbaykal has very slight rainfall and great temperature

● 132 variations during the year. The Amur-Ussuri region has almost double the rainfall and equally great temperature variations. The entire coastal area in general has still greater rainfall and a much smaller temperature range. The Anadyr' region again shows slight rainfall and high annual temperature variations.

The Amur-Ussuri region exceeds all other regions in the number of months with a mean temperature over 10°. In the coastal area the number of warm months decreases toward the north. The Anadyr' region again exceeds the northern coastal area and Kamchatka in the number of months with a temperature above 10°.

Transbaykal is a transition area in terms of its climate. It shows the signs both of the Siberian forest climate and also of that of the Mongolian steppes. In addition, a local factor in the climate /58/ with noteworthy influence is Lake Baykal. Only rarely does the annual rainfall exceed 300 millimeters. In this the driest areas do not only lie near the Mongolian border, where Novo-Selenginsk has an annual rainfall of only 162 millimeters, but remarkably enough the dry areas extend even to Lake Baykal. The Buryat who are settled on Ol'khon Island (169 millimeters) and in the Barguzin Valley are forced to use artificial irrigation. An exception in the general poverty of rain is the northern slope of the Khamar-Daban, which receives 515 millimeters annually at Mysovaya. Likewise the thicker snow covering and the heavier forestation of the northern slopes indicate that Transbaykal is preferentially supplied with dampness from the northwest. An important characteristic, here Mongolian, is the great contrast in the rainfall at different times of the year. In the summer half of the year 75 percent and more of the annual total falls, while the winter months (December, January, February) are considered very sparse in rainfall with 3-10 percent of the total. Winter brings very severe cold. At −31.4° Nerchinsk has the lowest mean temperature for January. As a result of the slight, often completely non-existent snow covering, the frost penetrates very deeply into the ground. Accordingly the land lies in the sphere of the permafrost, which with a depth of 57 meters at Mogzon station, west of Chita, reaches its deepest depth determined thus far in Transbaykal. Because snow is lacking, road traffic takes place in winter too by means of wagons or on sleds on the frozen rivers. Because of the dryness the streets are just as dusty as in the summer. An advantage of the Transbaykal winter--an East Siberian characteristic--is its imposing quietness, its pure air, and its constantly blue,

bright sunny skies. The air is so dry that the snow often evaporates directly without going through the liquid stage. On small brooks, which in many cases freeze to the ground, the ice often disappears leaving only the river bed. Spring is short. Since the time for the melting of the snow is almost completely lacking, the ground gets warm very quickly. For the same reason there is no high water in spring. The amount of water in the rivers depends on the rainfall and is largest during the summer. Summer brings very high temperatures. The unreduced July mean reaches 18-20°. Gruelling heat weighs upon the entire land, especially in the valley plains, and it is an economically important advantage of the Transbaykal climate that the summer months bring at the same time the most rainfall and the heaviest clouds of the entire year. In the course of the year, however, bright sunny days predominate by far. Transbaykal has a mean of 100-140 completely clear days a year; in this respect it approaches the desert type of climate.

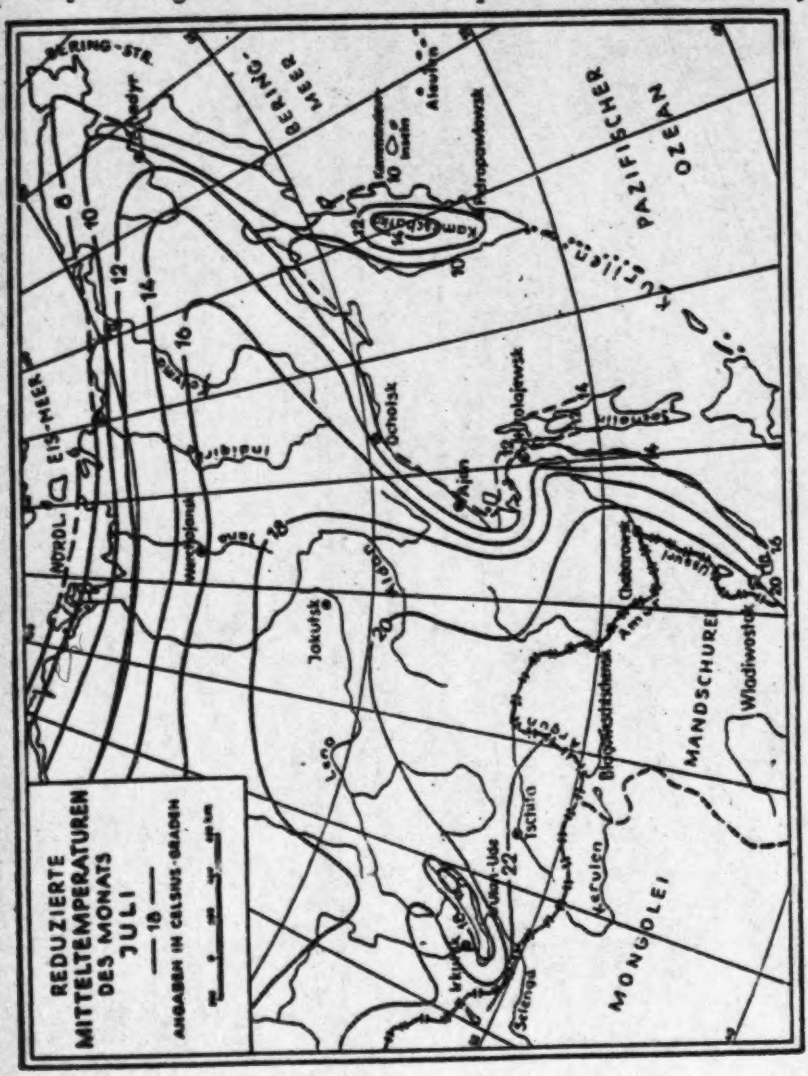
A phenomenon characteristic for the climate of Transbaykal, a phenomenon to which A. A. Borisov (39) in particular has called

39. Borisov, A. A. Klimaty SSSR /The Climate of the USSR/. Moscow, 1948.

attention, is the temperature inversion. /59//Map Showing the Reduced Mean Temperatures for the Month of July:/ /60/ If during the winter the Asiatic anti-cyclone forms over the continent with Transbaykal lying in part in the center of it, then the cold and heavy air masses collect in the valley basins, where they remain with extraordinary persistence. This explains the fact that the lower lying places as a rule have lower winter temperatures than the higher lying ones. Pereval'naya at 1,024 meters, for example, has a January temperature of -23.3°, while Chita at a height of 683 meters has a January mean of -27.4°, and Nerchinsk at 484 meters even has a January mean of -31.4°.

The influence of Lake Baykal is limited to its immediate environs, but this produces remarkable contrasts. In Listvenichnoye, at the point where the Angara flows from the lake, December and January are 10° warmer than in Ulan-Ude which is 90 kilometers from the banks of the lake, and June and July are 7° cooler. The annual range in temperature is 29.6° in Listvenichnoye versus 45.9° in

Map Showing the Reduced Mean Temperatures For the Month of July: 1320



Figures are given in degrees centigrade.

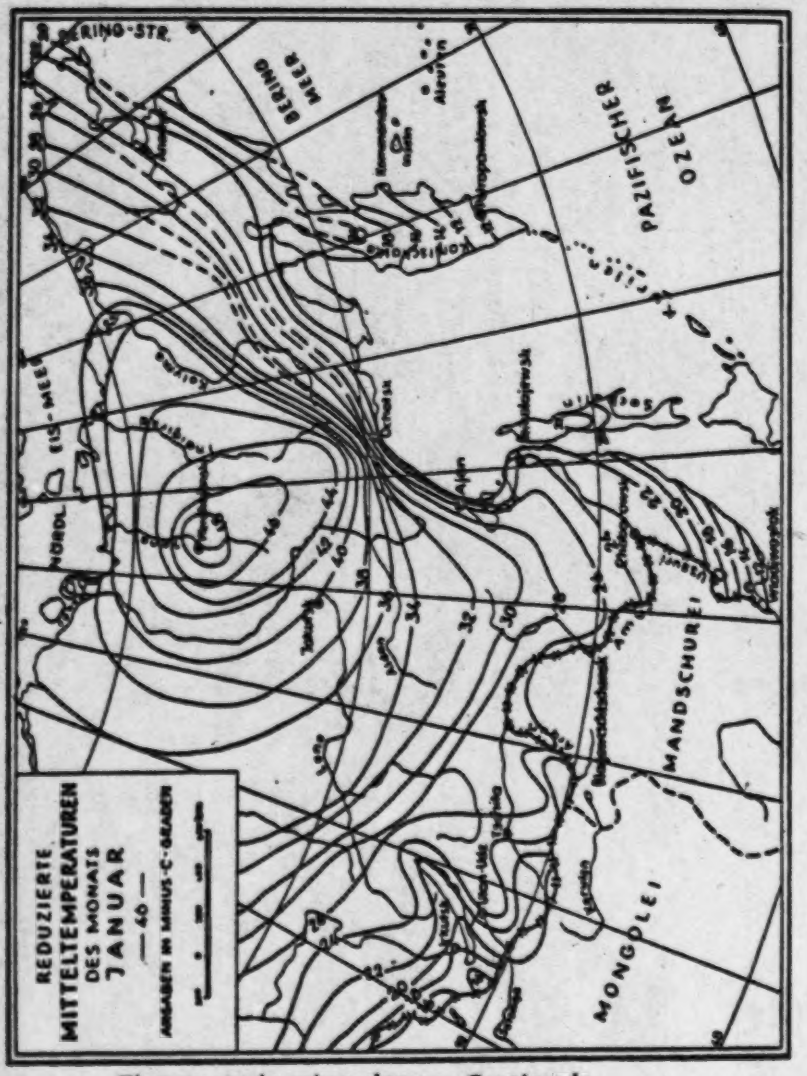
132 Ulan-Ude. As a consequence of the slow change in temperature of the water in Lake Baykal, the extreme months are postponed--all remarkable signs, which are reminiscent of an oceanic climate.

Within Transbaykal the Yablonovyy Range forms a climatic dividing line, which is expressed less in the meteorological data than in the plant covering which reflects the entire climatic conditions far better than the best instruments can record them. East of the [37] Yablonovyy Ridge deciduous trees appear in larger numbers. This shows, therefore, that the influence of the East Asiatic monsoon extends as far as here, and this is also confirmed by observation of the frequency of the change in wind directions. While in Ulan-Ude northwest and north winds rule absolutely the entire year, the frequency of these wind directions decreases significantly in the summer in Nerchinsk, where northeast and east winds appear above all.

The remaining regions of the Far East, as has already been said, stand in their climatic conditions in almost complete dependence on the seasonal change in air streams. The winter land winds bring down to the coast a high degree of coldness connected with dryness. But the summer sea winds, too, are disproportionately cool. In this connection the eastern border seas play a very disadvantageous role for the entire Far Eastern coast. The Sea of Okhotsk should be mentioned here in first place. It is a mighty cold water basin and is with justice designated the "ice cellar of east Siberia." The Kuril barrier hinders an exchange of water with the open ocean, and accordingly the water in the Sea of Okhotsk remains disproportionately cool (10°) even in summer under the continuing influence of the winter cooling-off by the surrounding land masses. In addition there is a cold ocean stream which stretches from north to south along the coast and even in summer carries great ice floes toward the south, /61//Map of the Reduced Mean Temperatures for the Month of January:/ /62/ where piled-up ice can be encountered even in July and August in the region of the Shantar Islands. In the Bering Sea and in the Sea of Japan, too, cold ocean streams move along the coast toward the south and lower the summer air temperatures not only through the water's own coolness but also through the formation of fog, which is a typical phenomenon for wide areas on the Far Eastern coast. Thus the general disadvantage of the east side of northern continents is especially marked here in the Soviet Russian Far East. Vladivostok (43° o7'N latitude) has the same July temperature as Moscow (55° 56'N latitude). Vladivostok lies at the same latitude as Nice but has a mean temperature for January of

Map of the Reduced Mean Temperatures for the Month of January

132.



Figures are in minus degrees Centigrade

-15.1° versus Nice's of 8.0°, and in July Vladivostok's temperature is 18.9° versus 23.2° in Nice. This disadvantage of the Soviet Far Eastern coast is shown especially forcefully if it is compared with the climatic conditions on the western coast of North America: 132

Mean Temperatures of the Soviet Far Eastern Coast and of the North American West Coast in Degrees Centigrade

Place	Latitude	Annual Mean	Coldest Month	Warmest Month	Annual Variation
Ayan	56°03'	- 3.9°	- 20.4°	12.4°	32.8°
Sitka	57°01'	+ 5.3°	- 1.0°	12.6°	13.6°
Nikolayevsk	53°02'	- 2.3°	- 23.4°	16.8°	40.2°
Tongass	54°08'	+ 8.1°	+ 1.1°	15.1°	14.0°
Vladivostok	43°02'	+ 4.3°	- 15.1°	20.8°	35.9°
Umqua *	43°07'	+ 11.4°	+ 6.8°	15.5°	18.7°

*/sic: probably is the Umpqua River in Oregon, which lies at this latitude/

The unfriendly influence of the Sea of Okhotsk, however, is limited more to the coastline since the mountain chains running parallel to the coast prevent a further penetration into the interior of the land, and accordingly the warm summer sun has more effect. As a result of this the division into climate areas on the coast is in contrast to the other climate areas.

The Amur-Ussuri Climate Province lies more landwards and comprises the region of the middle and lower Amur and the valley of the Ussuri. The Sikhote-Alin' and the Bureya Mountain Ranges protect these regions in the summer from the foggy and damp-cool air masses of the sea. Instead warm and damp winds coming from the southeast and south move over the broad plains of Manchuria and beyond the Amur to the north and effect a warm and damp summer in contrast to the continental harsh and dry winter.

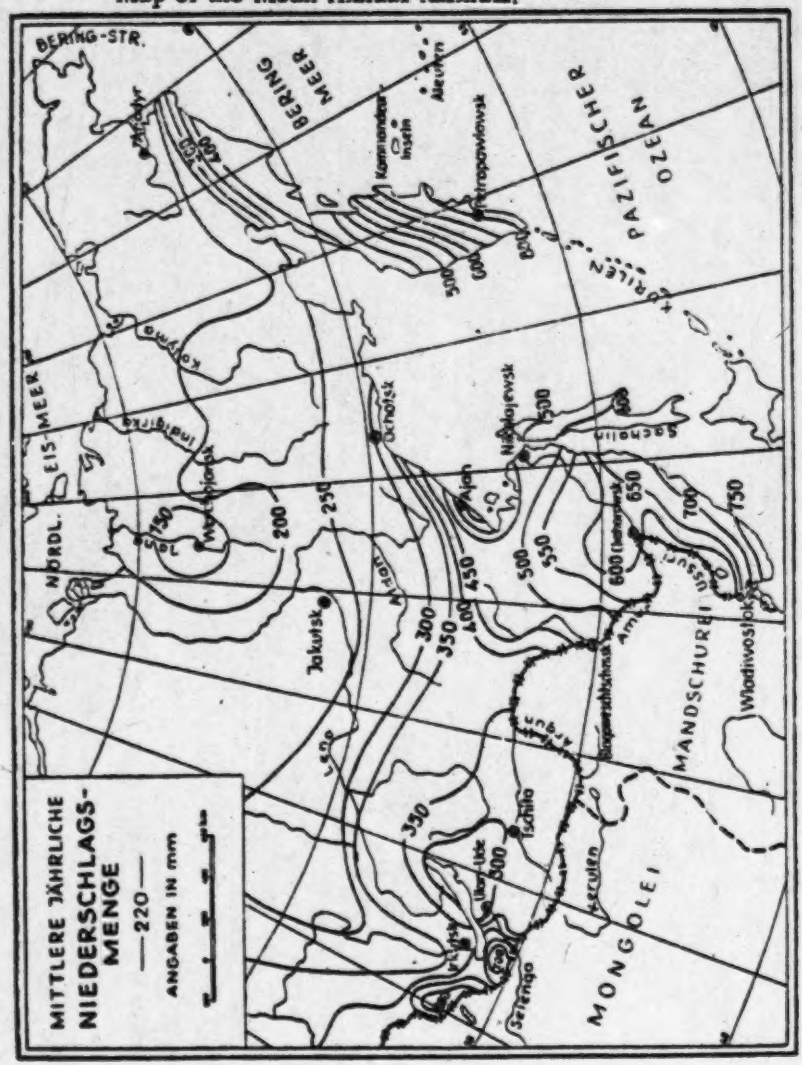
The favorable conditions of this climate region[1] are expressed strikingly in the vegetation, which is characterized by the appearance of deciduous trees such as oaks, elms, lindens, and other, trees which are lacking in all of Siberia and also in Transbaykal and on the coastal edge. [137]

The annual rainfall exceeds 500 millimeters in the entire area but understandably decreases from the coast toward the interior /63//Map of Mean Annual Rainfall:/ /64/ Thus Bikin

[1] [i.e. the Amur-Ussuri region -- Analyst]

Map of the Mean Annual Rainfall:

132.



Figures in millimeters.

132 in the middle Ussuri country receives 616 millimeters, Khabarovsk at the mouth of the Ussuri on the Amur receives 564 millimeters, Blagoveshchensk lying still farther to the northwest receives 525 millimeters. Of greatest importance is the fact that everywhere here the rainfall is concentrated predominantly in the summer. Almost throughout the entire country 85-95 percent of the annual total falls from April to November, and of this 50-60 percent falls in the three high summer months, June, July, and August, which therefore have much more rainfall here than by far the largest part of Transbaykal receives in the entire year. Blagoveshchensk receives 25 percent in both July and August; in short it receives half the annual total in two months. The annual course of the rainfall is shown by the following observations which represent the mean of six stations in the area. (79)

79. Hann, Handbuch der Klimatologie /Handbook of Climatology/ (Stuttgart, 1911), Vol. III, p. 292.

Rainfall in Percent of the Annual Total

Jan.	Feb.	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.
1	1	1	4	10	15	23	24	13	4	2	2

The same contrast as in the rainfall is shown also in the temperature during the course of the year; and in this the harshness of the winter is especially prominent. The summers, with a mean temperature of 20.2° to 21.2° for July, are warmer than in Transbaykal; the winters, with a mean temperature of -22.2° to -24.2° in January, are almost as cold. Remarkable is the great warming-up by leaps and bounds from April (means 2.4° to 3.7°) to May (mean 10.4° to 11.9°), and this is followed by a no less sharp drop in temperature from September (mean 12.1° to 13.6°) to October (mean 1.4° to 4.7°); accordingly the main vegetation period is only in months with a mean over 10°. The abnormally cold winter in the Amur country is explained by the flowing down of heavy, cold air masses from the higher continent to the coast, and these air masses follow the valley of the Amur and fill up all lowlands. Therefore, the basins of the Zeya and Bureya are distinguished by especially severe winters, and despite its southern position the Amur has the same freezing conditions as the rivers of northern Eurasia. Thus the Amur is closed by ice 197 days a year at Blagoveshchensk and 178 days a year at Nikolayevsk, 38 kilometers above its mouth. Accordingly, the Amur at Nikolayevsk (53°08' N

latitude) is covered with ice as long as the Dvina at Arkhangel'sk (64°33'). As a result of the lack of snow resulting from the slight rainfall in winter, vast regions north of the Amur belong to the sphere of the permafrost. 132

Spring is short. Summer quickly replaces winter. Summer unites great heat with the richest rainfall of the year and fills the land with warm-damp hothouse air. The relative humidity of the air--a characteristic of themonsoon climate--is at its greatest in July with 88 percent and at its lowest in winter /65/ with 68 percent in December. September, too, is relatively dry. Cloudiness in summer is much greater than in winter. Thus the duration of sunshine in December reaches its maximum with 75 percent of the possible, and in Khabarovsk it reaches even 90-95 percent, while it has its minimum in June with 34 percent. As a result of the heavier clouding in summer the daily temperature variations in summer are slighter than in winter. (At Khabarovsk the temperature variation in February is 7.3° and in July is 4.5°). Already in the beginning of June frequent and mostly short rain storms set in, mostly in the train of cyclones which, coming from the south or southwest, reach the Amur and the area of the Lower Ussuri and then move off toward the sea in the direction of the lower course of the Amur. The ends /Ausläufer/ of typhoons can also penetrate into this region. These whirlwinds bring damp air masses far into the land, and mostly cause heavy downpours, which can lead to dangerous floods as, for example, occurred in the Zeya and Ussuri region in July 1928 when a large part of the harvest in these regions was destroyed (63). In 1872 the Amur rose and flooded the city of

63. Friedensburg, F. "Gold," Die Metallischen Rohstoffe /Metallic Raw Materials/, No. 3, second edition, Stuttgart, 1953.

Blagoveshchensk, lying on the flat bank of the river, so badly that a small river steamer could travel down the main street. (132) Borisov

132. Michajlov, N. /Mikhailov, N./ and Pokschischewskij, W. /Pokshishevskii, V./, Reise über die Karte der Sowjetunion, //A Trip across the Map of the Soviet Union/,(Berlin, 1947), p. 445.

reports that in such a case more than 100 millimeters of rain can fall

132 within 24 hours. These conditions, especially the paths of the cyclones, have still not been clarified in detail. The real rain period does not begin until early in July and lasts until the end of August. During this period there is rarely a week without several days of rain.

In addition to the already mentioned downpours, rainfall also occurs in the form of land rains. A very characteristic type has been designated as "subsequent rain" /Nachfolgeregen/ by Arseniev. This occurs when after a storm the day is sunny and still, and then in the evening rain falls again because of the condensation of the rising, very high humidity.

The abundant rainfall of summer causes the rivers to swell, and their high water occasionally spills over the banks, and often interrupts all traffic. In many places the water cannot flow off right away. It remains standing on the level fields. Grass areas turn into swamps. In the low, broad plains on the left side of the Amur, above [312] Khabarovsk, plains which were supposed to have been won for agriculture to supply the rapidly growing city, a large-scale system of drainage canals had to be created, not only in order to drain the ground but also in order to give the rainfall an easier opportunity to drain.

132 The great dampness along with the great heat endangers and decreases
241 the harvest of European types of grain. The grain shoots into grass but the corn yield is slight. The sprouting of the plants suffers from the dryness, while the blooming, ripening, and harvesting fall in the rain period. In this the dampness of the ground /66/Climate Diagram: Ulan Ude; Chita/ also plays a role, for, according to many reports, the yield of the grain fields in the hilly country on the mountain ridges and slopes is higher than the yield of the fields in the valley areas. The softening of the ground by the summer rains makes the use of machinery difficult, and this appeared as a restraining factor in the establishment of the kolkhoz system and the MTS (Machine Tractor Stations). In part steps had to be taken toward the construction of new machines. On the other hand

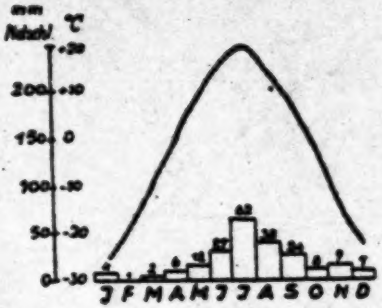
132 the climate fosters the development of vermin and fungus. The corns
137 of grain are not uncommonly attacked by a spore fungus (Fusareum roseum), which makes the bread "pianyi, " i.e. drunken, as the Russians say, because when eaten it has an intoxicating effect and causes nausea. Fruit is distinguished by richness in liquid but by a poverty of sugar. The Manchurian-Chinese cultivated plants and the natural native plant world thrive especially. Characteristic for the forests is a rich underwood, but the trees--and this applies especially to the deciduous trees--are very susceptible to disease, often becoming hollow with internal

Climate Diagram

•132

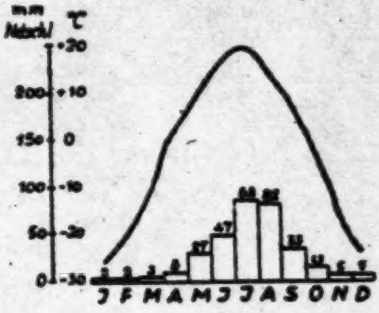
ULAN-UDE

542 m – 202 mm/Jahr



CHITA

683 m – 319 mm/Jahr



132 rot, and they are generally short lived. The usual leather boots are
137 scarcely to be used when going into the summer-damp woods, since they soften up in the damp ground covering and disintegrate.

132 The best time of the year is autumn, lasting through September October. It no longer rains. The sun shines brightly from a blue sky and in the almost complete calm emits an agreeable, bearable warmth. Once the frost comes, it lasts through the entire winter. It is seldom interrupted by a spell of thaw. The great dryness of the air is remarkable, even snow often evaporates.

/67/ /Climate Diagram: Blagoveshchensk; Vladivostok./

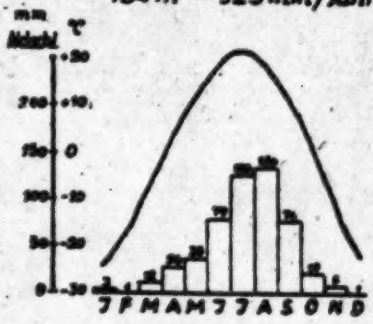
The coastal climate dominates the entire coastal strip from Vladivostok in the south to the north beyond Okhotsk. Because of the coastal strip's variations in width there are climatic variations between individual sections, but only in a gradual sense. It is useful, however, to divide the area in two, and to treat the southern coastal area separately from that of the north.

To the southern coastal area belongs the area from Vladivostok to the mouth of the Amur River. The hinterland is occupied in its entirety by the Sikhote-Alin'. Its principal chain acts as a climatic dividing line in summer and in winter. Despite the proximity of the ocean, the winter on the coast is marked by continental severity. It is more severe in the north, where a solid sheet of ice is formed between the mainland and Sakhalin Island, than in the south, where only a thin crust of floating ice is formed at the coastline. The entire coastal strip is subject to the cold, continental air masses pushing toward the sea. Nevertheless, temperatures on the coast are not as low as west of the Sikhote-Alin'. For one thing, the masses of air are forced down on their way to the sea, and this causes the temperature of the air to rise. Then there are also in-blowing winds, coming from the open sea, blowing even in winter, which contribute to the raising of the average temperature. In contrast to the winters, the summers of the coastal area show the characteristic traits of a maritime climate. The cool masses of air blowing inland from the sea are further cooled by the cold coastal current and contribute considerably to the lowering of temperatures in the coastal area, whereas to the west of the Sikhote-Alin', the influence of the sea on air temperatures is hardly perceptible anymore. The extent /68/ /Climatic Diagram: Okhost; Petropavlovsk/to whichthe Sikhote-Alin' acts as a climatic dividing line in relation to temperatures is demonstrated in the contrasts between the two localities Ol'ga and Voroshilov (formerly Nikolsk Ussuriyskiy), both on

Climate Diagram

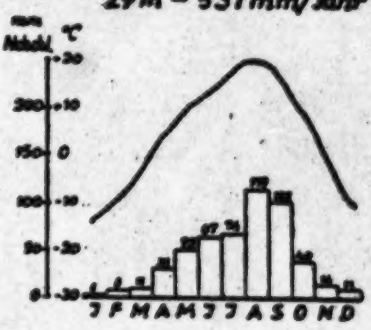
932 BLAGOVESHCHENSK

134 m - 525 mm/Jahr



VLADIVOSTOK

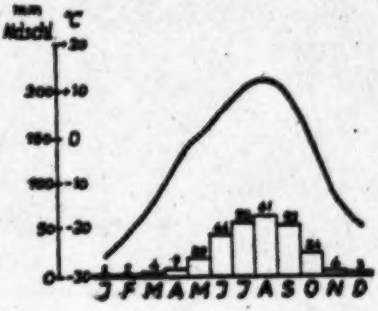
29 m - 537 mm/Jahr



Climate Diagram

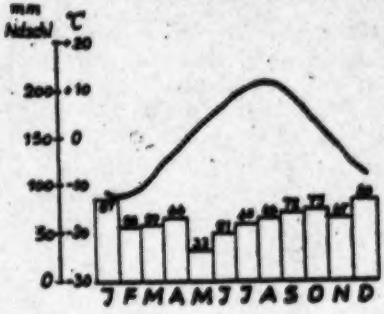
●132 OKHOTSK

6m - 283mm/Jahr



PETROPAVLOVSK

102m - 772mm/Jahr



132 approximately the same latitude and separated by only 275 kilometers:

	Ol'ga	Voroshilov
January	- 11.7°	- 19.5°
July	19.0°	21.1°

Another mark distinguishing the maritime character of the summer climate in the coastal area is the delay in the hottest period of the year; for in all the localities along the coast from Vladivostok to the mouth of the Amur River August is the hottest month, whereas all stations in the interior register July as the hottest month. The longer transitional periods on the coast can also be interpreted in the same way. The transition is not as sudden as in the interior of the Amur and Ussuri areas. Hence there is a longer period of vegetation in the coastal area, reducing in length as you go toward the interior. Ol'ga, for example, has a period of vegetation lasting 185 days, Khabarovsk one of 172 days, and Blagoveshchensk one of 164 days. On the other hand, the raw and humid summer hinders the growth of vegetation. On the eastern side of the Sikhote-Alin' trees generally grow less high than on the western side. North of the 44th latitude mountains higher than 1,200-1,300 meters are usually bare. On the other hand no glaciers form because of the scarce rainfall in winter.

The annual rainfall in the coastal area is as a rule greater than in the Amur and Ussuri area. In the seasonal /69/ distribution of the rainfall, too, the coastal region has a different picture than the interior of the land. The concentration of the rainfall in the summer months is not so strongly marked. Spring and fall have a higher percentage of rainfall. In the following comparison of the monthly rainfall (in millimeters) of Ol'ga and Blagoveshchensk, these traits appear clearly:

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.
Blagoveshchensk	3	1	12	26	38	79	128	136	74	19
Ol'ga	14	13	21	39	85	88	105	132	138	60

	Nov.	Dec.	Total for Year
Blagoveshchensk	5	1	522
Ol'ga	40	17	752

The contrast appears more sharply if the individual seasons are summerized together. (Figures are in millimeters):

	winter	spring	summer	fall	year
Blagoveshchensk	5	76	343	98	522
Ol'ga	44	145	325	238	752

The different type of distribution of the annual rainfall goes back to the cyclone activity. The regular paths of cyclones in East Asia move toward the north with the beginning of and during the warm season. In the early part of the year they reach the coastal area, but they reach the Amur and Ussuri region only in the summer and then withdraw again toward the south; accordingly the coastal area is also visited by numerous cyclones in the fall. Thus the cyclone activity is more active in the early year and fall than in the summer; and accordingly the great part of the summer rainfall undoubtedly goes back to the monsoon winds. However, the entire phenomenon of cyclone activity and also the appearance of the ends of typhoons in the Soviet Russian Far Eastern region has still been too little investigated to make it possible to give more exact and final data. Vladivostok and also the southern Sikhote-Alin' are often, especially in late summer, visited by strong storms, which frequently can take on a typhoon-type, destructive character.

A further characteristic of the coastal climate is the frequent appearance of fogs. These arise where the surface water temperature is lower than the rest of the sea. That is the case in the cold stream off the coast. With the predominance of southeastern winds in the summer periods these warm air masses, satiated with dampness, are borne toward the continent. On passing over the cold water stream they quickly cool off, a phenomenon which is contributed to by the mixture with local, relatively cold air masses. With this the air masses are forced to separate off the excess of dampness brought along, and this happens in the form of fogs. These often /70/ envelop the entire coastal strip for days and are often driven into the land with their damp coolness. This makes especially noticeable the contrast between the completely fog-covered coastal strip and the interior of bays, which remain free of fog. The cape "Nizmennyy Mys" lying before Ol'ga Bay is regularly enveloped in fog on 26 days in June and July, while the city of Ol'ga itself, which lies within the bay and is separated from the entrance to the bay only by a low, forest-covered mountain, has only 9-11 foggy days during the same period. In many years, however, it also happens that the month of July brings fog on 21-22 days.

132 The northern coastal country, reaching from Nikolayevsk on the Amur in the south to Shelekhov Gulf in the north, has a rougher character than the southern part. Okhotsk has a mean temperature for January of -25.2°, while Leningrad--lying at approximately the same latitude--has a mean January temperature of only -7.6°. The raw climate of the summer is traceable not only to the northern position but also very much to the cooling influence of the Sea of Okhotsk with its ice masses, which are preserved along the coast until the beginning of summer. Furthermore, there are the effects of the cold ocean stream along the coast (from north to south) and the cold water strips (see description of the Sea of Okhotsk) with their fogs, which are driven into the coastal area by the constant sea wind, sometimes even going up the Amur to Bureya since no morphological hinderances stand in the way of the penetration of the sea air masses.

The winds have a clearly marked monsoon charater. In the winter they blow from the cooled-off continent toward the sea, and in the summer the opposite is true. But here the contrast in the strength of the wind is remarkable. As a result of the barometric contrast between land and sea of 22 millimeters, the winter monsoon is much more strongly marked than the monsoonal air movement of the summer since then the fall in air pressure is only 6-7 millimeters. Powerful land winds--not uncommonly with the character of a storm--predominate from October to March. In the same period Okhotsk has 83 percent north and northwest winds with a velocity of 5 meters per second and more and only 5 percent calm; Nikolayevsk, which lies 38 kilometers above the mouth of the Amur and thus is somewhat distant from the coast, still has 64 percent land winds with a wind velocity of 3.8 meters per second and only 14 percent calm. In the summer, on the other hand, Okhotsk has only 50-52 percent winds with a velocity of 3 to 3.5 meters per second.

The summer temperatures are very much lowered by the cooling effect of the Sea of Okhotsk, but the influence of this sea doesn't reach far into the land, and on the coast from the Uda Bay to Okhotsk it reaches as a rule only the nearby watershed. Thus the Sea of Okhotsk influences only the mountain slopes inclined toward the sea, while on the other side of the ridge the warm continental summer rules. /71/ Astonishing is the contrast noted by travelers coming in the summer from Yakutsk to the coast. Oppressive heat of 30° and more with a completely clear sky still exists not far from the coast, and the coast has cool, damp, foggy weather with cloudy, overcast skies. Every breath of wind coming from the interior to the coast brings

welcome warmth, even heat, but also the unbearable plague of gnats unknown in the coastal area with its sea wind. Strikingly low is the June mean (Ayan 5.2°, Okhotsk 5.4°), but even August, the warmest month, reaches a mean of only 12-13° (Ayan 12.5°, Okhotsk 13.5°). The winter temperatures are markedly low, since the solid ice belt, which forms off the coast, and the floating ice, which covers the entire northern part of the Sea of Okhotsk, keep away from the coast the moderating influence of the sea. Nikolayevsk on the Amur has a mean temperature for January of -24.5°, Ayan one of -20.3°, and Okhotsk one of -25.2°.

/32

The annual rainfall decreases generally from south to north. Okhotsk receives 283 millimeters of rainfall, and Nikolayevsk 447 millimeters. Ayan with a rainfall of 889 millimeters is an exception both in this and also in winter temperature; this is caused by local conditions. The annual rainfall along the entire coastal area is extraordinarily variable. In rainy years Nikolayevsk receives up to 701 millimeters; in dry years, on the other hand, it receives only up to 199 millimeters. The bulk of the rain falls in the summer and at the beginning of autumn; thus in this period 87 percent of the annual rainfall comes down in Okhotsk and 91 percent in Ayan.

Following the pattern of the rainfall, the cloudiness in summer is greater than in winter. As a mean this amounts in percentage:

	winter	spring	summer	autumn
Okhotsk	37	58	76	48
Nikolayevsk	42	56	60	55

The number of overcast days is largest in June, which has a mean of only 1-4 sunny days. Also the relative humidity of the air reaches 85 percent during this month, which is the maximum for the year.

The blossoming of the vegetation begins after the thawing of the snow cover at the end of May and the beginning of June. In the summer cool and damp days predominate. The winds constantly blowing from the sea often bring fog and a fine, heavily wetting drizzly rain. In late fall the winds abate, the weather is less rainy and is felt to be warmer, but already at the end of September the first snow falls, and the cold of winter sets in. The length of the vegetation period increases from north to south. In Okhotsk it amounts to 109 days (6 May to 24 September), in Nikolayevsk 138 days (22 May to

8 October).

•132 The climate of the northern regions, comprising mainly the Anadyr' area and the Chukchi Peninsula, differs from the other areas in the Far East in the smaller effect /72/ of the monsoonal air circulation, in a long, harsh winter and a short, but comparatively warm summer; the mean temperatures of the warmest months exceed those of the northern coastal region and in part also those of Kamchatka. The farther away from the coast the less the monsoonal influence becomes, the annual range of temperatures increases, and the climate acquires continental traits.

In the vicinity of the coast the winter is still milder, the summer cool. Novo-Mariinsk /now: Anadyr'/, at the bay at the mouth of the Anadyr', has a July mean of 10.4° as opposed to Markovo which is at approximately the same latitude but lies 300 kilometers inland and which has a July mean of 14.1°. Markovo has three months with a mean over 10°, while Novo-Mariinsk /now: Anadyr'/ has only one month, the warmest, whose mean exceeds 10°. In the winter it is the reverse: Novo-Mariinsk /now: Anadyr'/ has a mean temperature for January of -23.3° and Markovo one of -28.7°. The rainfall is generally slight and, with the exception of the southeast (the coast of the Koryak Peninsula has 250 millimeters), nowhere exceeds 200 millimeters. In the summer half of the year, as a consequence of the predominant east winds, the coastal regions mostly have bad weather with numerous fogs, while in the same period dry, windless weather with clear skies and sunshine rules in the interior. Because of the greater warmth and because of the rainfall in the summer, there develop in the river valleys and in protected lowlands forests which consist of alders, willows, aspens, and birches, while in the coastal strip shrubbery at most appears; but mostly there is only tundra vegetation. However, the rule of the warm summer doesn't last long and is replaced by a cool, rainy fall followed already in September by the cold and snow of winter. Then north and northeast winds, which have a great velocity and which are feared for their snow storms, predominate. Many regions, especially mountains, are blown free of snow, while the snow is carried to other places to form great masses, which remain until the beginning of June and sometimes even until August.

Sakhalin

The climate of the island of Sakhalin, which stretches

approximately from the latitude of Hamburg to that of Trieste, is completely included in the sphere of the coastal climate. The reason for the roughness of the climatic conditions at this latitude lies in the position of the island in the vicinity of the Asiatic continent, with its east Asiatic monsoon climate, and the nearness of the Sea of Okhotsk, with its cold water masses, the cold stream with floating ice floes, which stretch along the east coast into the first half of the warm season. Only in the southwestern part of Sakhalin Island is the climate milder, because of a /73/ branch of the warm ocean stream which comes from the south of the Sea of Japan; and it is for this reason that the west coast is milder here than the east coast.

The fact that the island stretches 950 kilometers from north to south and the two mountain chains, which traverse the island in the same direction and follow protectively the valley depression of the Tym' and Poronay lying between the mountain chains, create the differences in the climatic conditions and in the character of the landscape. The degree of coldness in the winter decreases with the measure of the distance from the northern end of the island toward south, while the summer temperatures are equalized. The mean of the coldest month changes from -23.4° in the valley of the Tym' (Kirovskoye) to as much as -8° at the southern tip of the island (Cape Crillon). There is a much smaller difference in the summer temperatures, which are 15° in the central part and 17° in the south. The absolute minimum varies from -48° in the north to -31° in the south. The vegetation period increases significantly in length from north to south. At the northern end it is only 97 days (Okha), in the valley of the Tym' it is 146 days (Kirovskoye), and at the southern end of the island it is 167 days (Korsakov).

The protected central valley depression and the open coastal plains, subjected to the influence of the cold ocean with its constant fogs, show very great differences in thermic conditions, especially in winter; but in summer there are almost no differences. While the January temperatures are -16.6° on the west shore and -23.4° in the central depression, the warmest month on the west coast (August) has a temperature of 16.2°, and the warmest month in the central depression (July) also has a temperature of 16.2°. The difference in the warmest months points to the more continental climatic character of the central depression, which is protected from the influence of the sea; in this depression the warmth rises as high as 32° in the summer, and in the winter the temperature can sink to as low as -48°. The

J32 mean annual temperature variation reaches 39.6° here, while it is 35.3° on the west coast and only 32.8° on the east coast. In comparison with the coast, the central valley depression has more calms, or winds of less velocity. The fog from the coasts, which is brought in by the winds at greater heights over the valley, looks like gray clouds and at most causes a light drizzling rain.

The west and the east coasts lie under the influence of two other seas differing in their temperatures. Near the southwest coast flows a branch of the warm stream coming from the Korean Strait. Only at the beginning does it touch the banks, and then it is pushed from the banks by a cool stream of less size coming from the La Perouse Strait; this cool stream at first accompanies the warm one. The northern part of the west bank and the east bank are, on the contrary, subjected to the influence of cold water masses, which appears on the banks in the west as water driven up /Auftreibswasser/ and in the east as a cold stream. The cold /74/ surface water of the Sea of Okhotsk is the reason for the summer covering of fog, which often hangs for weeks on the banks.

The northeastern and northern winds which in the winter blow over the Sea of Okhotsk, which is cool but not frozen over in the southern part, moderate the coldness of the winter and bring relatively heavy snowfall with frequent snow storms (buran). As a result of the predominant east winds with their fog, the summers are very cool: nowhere does July have a mean above 12°. On the west banks 600 to 800 millimeters of rain falls a year, and of this approximately half falls as snow. The summer is rainy. In July and August there is rarely a day without rain. September generally has the maximum rainfall, and February the minimum. The relative humidity of the air is very high all year round, and amounts on the average to 77-89 percent. While the mountain chains show a certain differentiation in climate in the south, this is not the case in the north of the island, where the mountains flatten out.

The winter period lasts 7 months in the north, 5-6 months in the south. March still has the character of winter everywhere, its mean being -5.3° in the south and more than -11.2° in the north. It is especially distinguished by the appearance of snow storms. For most of the winter the snow lasts no less than 200 days. At the same time the storms provide a very uneven distribution of snow, with many areas remaining free of snow, while in the valley depressions and basins

the snow masses pile up and often can even completely bury human dwellings. Solid ice seldom forms on the east coast even though floating ice floes can often be found on the sea even in June. The Strait of Tatar regularly becomes a solid ice bridge with the continent from December to March. Floating ice forms in the middle of the winter off the southwest coast and in the La Pérouse Strait. Spring is unfriendly and brings frost even in the beginning of June. Summer lasts only 2 to 2 1/2 months in the north, where only July and August are frost-free. The rainfall of summer consists mostly of light but continuous rain. The frost-free period begins earlier in the central depression and on the southwest coast; here June already brings higher temperatures, and July shows the full unfolding of summer. Autumn last two months and is warmer than spring, although the first frost appears in the north of the island in September.

The climatic conditions, especially in the north of the island, are not very favorable to agriculture. Along the flat coastal strip, covering an extensive area in various places, is tundra vegetation with Arctic flora; even today reindeer graze here--approximately /75/ at the latitude between Hamburg and Hanover. The conditions are most favorable in the central depression and on the southwest coast. Here summer wheat, summer rye, oats, and barley flourish.

Kamchatka

The climate of Kamchatka is rougher than could be expected from its latitude. The climate is determined by the peninsula's position between continent and ocean and its closeness to two cool seas and cold ocean streams; however, the coasts are significantly milder in climate than the coast of the neighboring continent. The winds have a monsoonal character. In the winter they blow from the Asiatic continent to the ocean, i.e. northwest winds predominate; in the summer, on the other hand, east and northeast winds predominate. Both in duration and strength the winter monsoon far exceeds the summer one, which appears only in June. In Petropavlovsk the winter monsoon has a mean velocity of 8.1 meters per second; the summer one has a mean velocity of only 4.2 meters per second. In this it must be taken into consideration that the northern half of the Sea of Okhotsk is for the most part covered with ice in the winter and acts as a climate extension of the continent.

But within this general air circulation appears a second, regular

/132 air movement, caused by local conditions; this second air movement in part works against the monsoonal one and plays a not unimportant role in the climatic conditions. In the winter there forms in the center of Kamchatka an area of high air pressure, which, in the form of a narrow tongue, extends into the peninsula from the northeast of the continent and coincides approximately with the Kamchatka Valley, which is protected by mountains on the east and the west; accordingly the air pressure decreases from north to south. The air masses flowing from this high pressure area of their own fall in with the direction of the general monsoon in the east; on the west side, on the other hand, they work against the general monsoon. For this reason the winter monsoon on the east coast (Petropavlovsk) is stronger than on the west coast. In the summer an opposite development is completed within the peninsula. A barometric depression forms over the protected Kamchatka Valley, and accordingly the local winds arising thereby in the east again fall in with the general monsoon direction, while the local winds in the west move against it. These conditions explain the fact that the monsoonal winds both in summer and in winter appear as a typical phenomenon only in the coastal strip, while toward the interior of the peninsula it occurs as a local deviation. The general monsoonal effect in the eastern part of the peninsula is strengthened by local influences. Irregularity and change in the general picture brings the appearance of Pacific cyclones, which, however, have still been very little investigated. In winter their appearance is coupled as a rule with northeast winds.

/76/ /Sketch Map of the Wind Directions:/

The great stretch of the peninsula from north to south, along with the morphological division, changes the general face of the climate in the individual provinces. Characteristic is the decline in the winter temperatures with the distance from the coast and the rise in the summer temperatures and the annual variation in temperature in the same direction. We find the lowest winter temperatures in the Kamchatka Valley, where Mil'kovo has a January mean of -25°, while the coasts have higher temperatures: thus Ust'-Bol'sheretsk on the west coast has a mean of -15.1° and Petropavlovsk on the east coast has one of -11.2°: these last two figures are the mean for February /77/ /Sketch Map of Wind Directions:/ which here is the coldest month. This, too, is a characteristic sign of the contrast between the coastal zones and the interior. In April the temperatures are almost completely the same throughout the peninsula. In summer the interior is again warmer (Klyuchi, July mean 14.7°), while the coasts are relatively cool: thus

Sketch Map of the Wind Directions:

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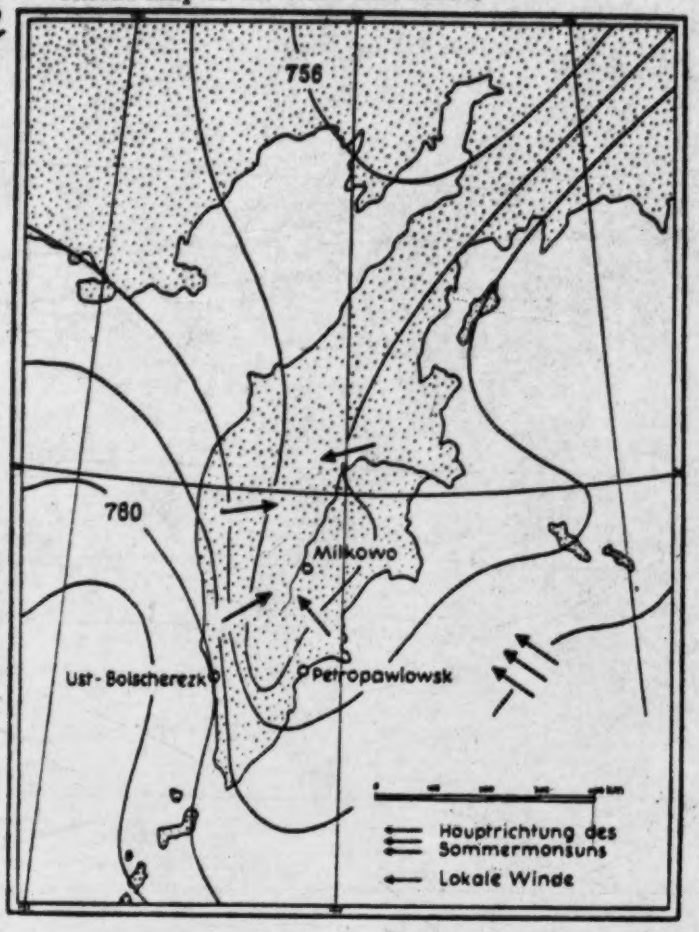
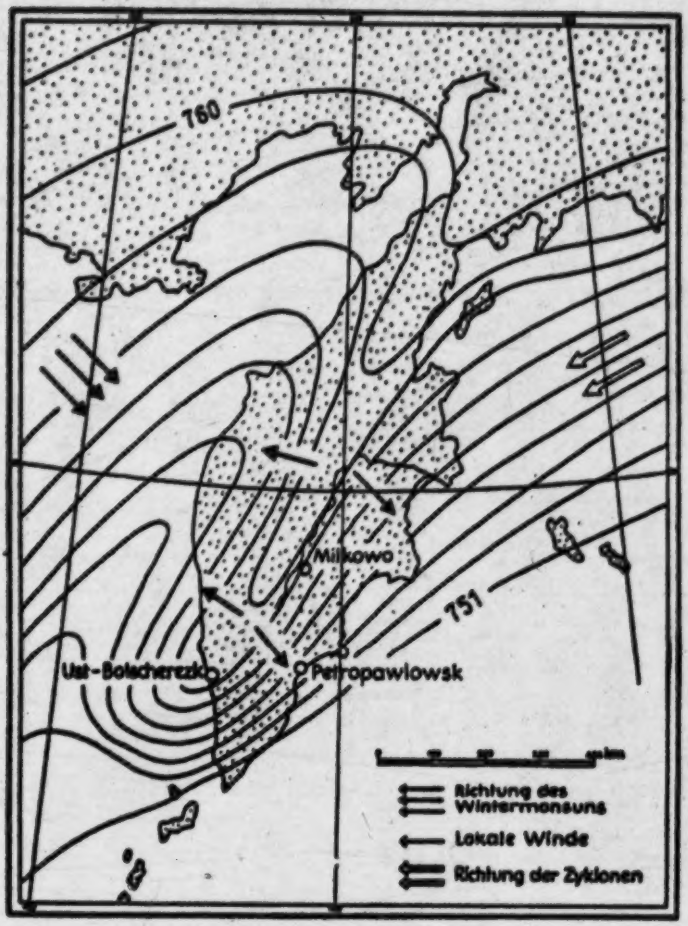


Main Direction of the Summer Monsoon

Local Winds

Sketch Map of Wind Directions:



Direction of the winter monsoon

Local winds

Direction of the cyclones

Ust'-Bol'sheretsk has a mean temperature for August of 12° and Petropavlovsk one of 11.9°. In October the temperatures are again even over the entire peninsula. The absolute maximum of 28° and the absolute minimum of -50° have been determined in the Kamchatka Valley, where, too, the greatest daily variation of more than 15° has been measured. /78/ In Kamchatka the vegetation period begins around the end of May or beginning of June and ends the beginning of October. It lasts the longest in the interior of the peninsula, while it is significantly shorter on the coasts and in the north. Thus in Klyuchi the length of the vegetation period is 134 days, in Petropavlovsk it is 127 days, in Ust'-Bol'sheretsk 107 days, and in Tigil' (in the north) only 96 days.

The annual rainfall generally decreases from the southeast of the peninsula, where it is more than 800 millimeters, to the northwest, where it sinks to 350 millimeters and less. The coasts receive the greatest rainfall, while the Kamchatka Valley is prominent for its slight rainfall. The number of days with rain ranges between 120 and 200, the number of days with snowfall ranges between 70 and 96. Characteristic of Kamchatka is the great duration of the snow covering, which generally remains almost until the end of May and in the mountains often remains even into June; however, the appearance of the first snow is very late in comparison with the neighboring regions of the Far East. September is as a rule still without snow. In the annual distribution of the rainfall there are two high points--summer and winter--while spring and fall bring slighter rainfall. The relative humidity of the air is higher in winter and summer than in the transitional seasons, and in this the coastal zones exceed the interior. The maximum on the coast (Petropavlovsk) has been recorded in August when it is 87 percent.

Clouding is greater in summer than in winter, but the difference is not so great as in the other regions in the Far East. Within Kamchatka, naturally enough, the coastal regions show a greater clouding. On the west coast (Ust'-Bol'sheretsk) it reaches 89 percent in July, 67 percent in December, while in the Kamchatka Valley (Mil'kovo) it is 69 percent in July and only 49 percent in December. Very sharply marked is the difference between the coasts and the interior in the number of bright, overcast, and foggy days: (Table on following page)

Characteristic of the coastal regions of Kamchatka, especially in summer, are the thick fogs which give the traveler a gloomy impression of the land. In Petropavlovsk it is foggy almost every second day. Fogs dominate the west coast even more, while in the interior

J32 Relative Numbers of Bright, Overcast, and Foggy Days

	January			July		
	bright	overcast	foggy	bright	overcast	foggy
Ust'-Bol'sheretsk	2	14	1	0	25	25
Mil'kovo	18	6	3	3	16	0

fog very seldom occurs in the summer.

Kamchatka can be divided into three regions according to the climate differences: the east coast, the west coast, and the interior.

/79/ The east coast lies under the oceanic monsoon in summer; in winter, apart from the north winds, it lies under the Pacific cyclones coming from the northeast and generally under the cold ocean stream, especially in the north, while in the southern part of the coast the moderating influence of the Pacific is more noticeable. The southeast coast, therefore, with a temperature range of 23.1°, has the smallest annual range in temperature. Winters along the east coast are generally mild (February -11.9° to -13.9°), and the summers are cool (August 11.9° to 12.5°). The nearness of the ocean postpones the extreme months to February and August. The ground freezes only to a slight depth (10 centimeters). In contrast to the other monsoon areas in the Far East there is only a slight difference in rainfall between summer and winter. In this connection the east coast is distinguished by an abundance of winter rain in contrast to the other parts of the peninsula, especially in contrast to the interior. This abundance of winter rain on the east coast is brought by the northeast winds coming from the sea with their cyclones; these cyclones can often bring great quantities of rain in a brief period. Thus 189 millimeters once fell in Petropavlovsk in one day in October (205). In certain winters, especially warm ones,

205. Suslov, S.P., Fizicheskaia geografiia SSSR /Physical Geography of the USSR/, (Moscow-Leningrad, 1947), p. 371.

there is often more rainfall than in the summer half of the year. As a consequence the east coast has a high snow covering with a mean of 130 centimeters, in individual cases even of 300 centimeters (March, 1916). The southeast coast is especially notorious for its days with snow storms and snow drifts. Not uncommonly the snow drifts go up to the roofs of the houses in Petropavlovsk. The snow thaws in May to the beginning of June. In some years the volcanic ash which falls down has an accelerating effect on the thawing of the snow. Summer

on the east coast is distinguished by heavy clouding and numerous fogs. In July as a rule half the days are foggy. 132.

The western coastal area is more under the influence of the Sea of Okhotsk and is dominated in winter by the cold and dry monsoon and northeast and east winds, which come from the center of the peninsula and which are cold and dry, in contrast to the east coast. For these reasons the rainfall in the winter is only a fraction of the summer rainfall: the winter rainfall is only a fourth to a third of the summer rainfall. The snow covering on the west coast is therefore slight, generally reaching only 40 centimeters. However, the distribution is uneven since the winds coming from the mountains often blow the mountains free of snow and pile the snow in the troughs and valleys. However, in contrast to the east coast, snow storms are a rare phenomenon. Summer is cool and especially foggy, the clouding is very great. The local winds, which move into the interior of the island, often carry fog into the land for days and bring a damp coolness, which is of little help to plants. /80-81/Charts on following pages/ /82/ The vegetation period is significantly shorter on the western side of the peninsula than on the eastern side.

The peninsula's central depression, which for the most part is occupied by the valley of the Kamchatka River, is extensively protected from the influences of the sea by two mountain chains on the east and the west; accordingly clearly marked, continental traits can be recognized in the climatic conditions here. Summer is warmer and drier than on the coasts; winter, on the other hand, is harsh but brings less snow than on the east coast, though even more than on the west coast. Characteristic of the central depression are the rapid transition from winter to summer and the warm autumn; accordingly we find here the longest vegetation period on the peninsula. The stone birches unfold their buds already in the middle of May here, while they appear in the coastal areas only around the 15th of June. As a consequence of this favorable condition, Kamchatka's central depression is most favorable for agriculture, which has already spread here on a large scale, while the coastal areas offer more opportunities for developing animal breeding.

The Border Seas of the East

Through its possession of the Kurils and southern Sakhalin, the Sea of Okhotsk has become a Soviet Russian internal sea since 133

/80/ Mean Air Temperatures in Degrees Centigrade

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Transbaykal													
Barguzin	-27.0	-23.4	-12.1	-0.3	7.6	15.0	18.2	15.8	8.6	-0.6	-12.8	-23.8	2.9
Ulan-Ude	-26.7	-21.7	-11.9	0.5	8.1	16.2	19.2	16.4	8.4	-0.9	-13.0	-22.5	-2.2
Troitskosavsk /now: Kyakhta/	-23.1	-19.0	-9.8	1.6	9.4	16.7	19.2	16.5	9.0	0.1	-10.8	-19.1	-0.8
Chita	-27.4	-22.3	-12.4	0.0	7.9	15.7	18.7	15.4	8.2	-1.7	-14.5	-24.1	-3.0
Nerchinsk	-31.4	-25.5	-15.0	-0.2	9.5	17.2	20.5	17.0	9.6	-1.8	-17.0	-28.9	-3.8
Amur-Ussuri-Area													
Blagoveshchensk	-24.2	-18.1	-9.5	2.4	10.4	17.4	21.2	18.7	12.1	1.4	-11.4	-21.6	-0.1
Khabarovsk	-23.1	-17.4	-8.8	2.8	10.9	16.7	20.2	19.6	13.6	4.2	-8.3	-19.4	0.9
Bikin	-22.2	-17.4	-8.7	3.7	11.9	17.0	20.4	20.3	12.6	4.7	-8.0	-19.3	-1.2
Coastal Area													
Vladivostok	-13.7	-10.1	-3.7	4.4	9.5	13.6	18.1	20.6	16.5	9.3	-0.5	-9.6	4.6
Ol'ga Bay	-11.7	-8.8	-2.8	-4.2	8.6	12.4	16.9	19.1	14.5	7.1	-1.8	-9.7	4.0
Nikolayevsk	-24.5	-19.8	-12.7	-2.6	3.6	11.4	16.7	16.1	11.4	2.0	-9.9	-20.1	-2.1
Ayan	-20.3	-15.7	-10.1	-2.8	1.7	5.2	12.2	13.5	10.1	0.2	-10.6	-17.6	-2.9
Okhotsk	-25.2	-20.5	-14.5	-6.0	0.3	5.4	11.7	12.5	8.1	-2.3	-15.4	-21.9	-5.7
Kamchatka													
Petropavlovsk	-11.0	-11.2	-7.2	-2.0	2.2	6.7	10.6	11.9	9.2	3.9	-2.5	-7.6	0.2

(Chart continued on following page)

/80/ Mean Air Temperatures in Degrees Centigrade

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Bol'sheretsk	-13.6	-15.1	-10.1	-2.5	2.1	5.0	11.0	12.0	7.8	-2.4	-3.5	-10.2	-1.2
Sachalin													
Aleksandrovsk	-19.1	-15.6	-9.6	-0.2	5.2	10.8	15.5	16.2	12.0	4.1	-5.6	-13.9	0.0
Korsakov (Otomari)	-11.2	-9.9	-5.3	-1.2	5.3	9.6	14.5	16.8	13.7	7.2	-0.6	-7.2	2.8
Far North													
Markovo	-28.7	-25.7	-23.3	-15.2	-2.4	10.0	14.1	10.1	3.0	-8.6	-19.7	-26.3	-9.4
Novo-Mariinsk /now Anadyr'/	-23.3	-21.3	-19.9	-14.9	-3.8	4.9	10.4	9.4	3.7	-4.8	-15.1	-21.5	-8.1

3: Thiel--87 K-4,5 (no date) 1953 RRL Siberia RRL

/81/ Rainfall and Distribution in Millimeters

	Height in meters	Annual total	Summer half of the year	Winter half of the year	June, July, August	December, January, February
Transbaykal						
Barguzin	500	200	200	60	131	29
Ulan-Ude	542	202	179	33	127	12
Troitskosavsk /now: Kyakhta/	760	280	256	24	161	10
Chita	683	319	285	34	217	9
Nerchinsk	484	281	249	32	180	10
Amur-Ussuri-Area						
Blagoveshchensk	134	522	481	41	343	5
Khabarovsk	50	564	487	77	349	18
Bikin	73	616	496	120	308	29
Coastal Area						
Vladivostok	29	537	446	91	260	24
Ol'ga Bay	45	752	587	165	325	44
Nikolayevsk	21	447	300	147	168	48
Ayan	10	889	665	224	441	36
Okhotsk	6	283	244	39	163	7
Kamchatka						

(Chart continued on following page)

/81/ Rainfall and Distribution in Millimeters

	Height in meters	Annual total	Summer half of the year	Winter half of the year	June, July August	December, January, February
Petropavlovsk	102	772	348	424	177	215
Bol'sheretsk	10	525	389	136	207	52
Sachalin						
Aleksandrovsk	16	600	335	265	174	104
Korsakov (Otomari)	37	494	304	190	325	77
Far North						
Markovo	26	200	142	58	103	25
Novo-Mariinsk /now: Anadyr'/	5	189	138	51	94	25

3: Thiel--89 K-4,5 (no date) 1953 RRI Siberia RRI

Map of the Sea of Okhotsk:

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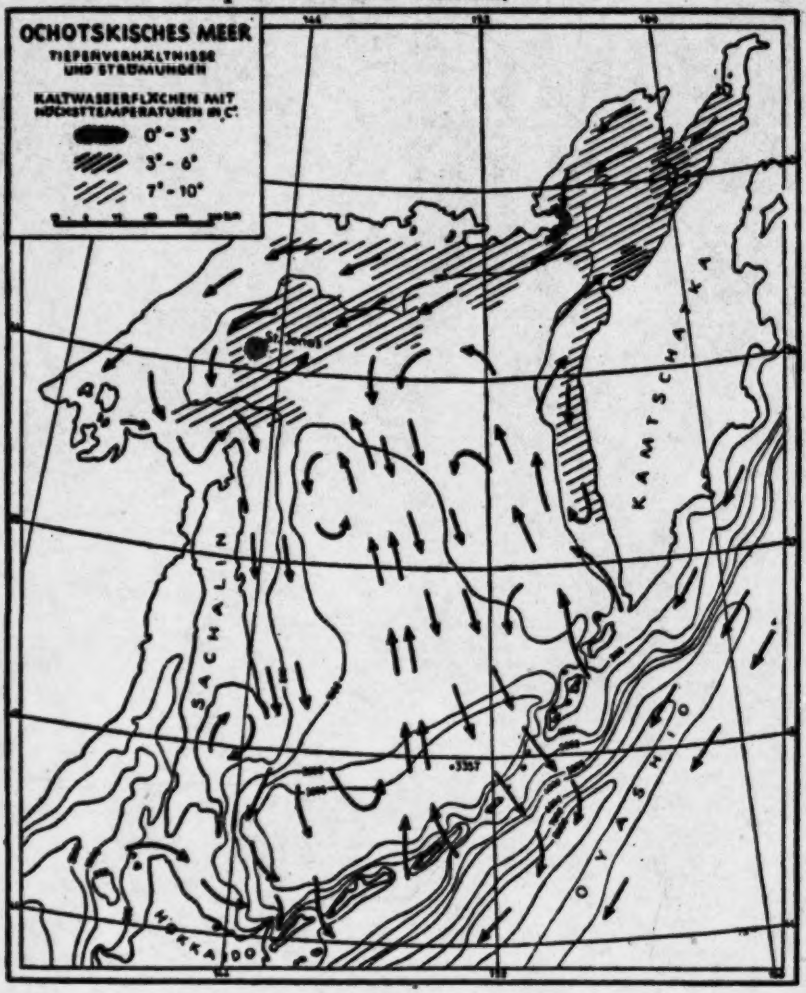

Depths and Currents; Cold water areas with highest temperatures in degrees centigrade

takes place. The Pacific surface water enters the Sea of Okhotsk 133
through one series of sea connections between the Kurils, while through others there is a surface flow of water from the sea to the ocean. At the deeper levels of water the exchange works in the opposite direction from that on the surface. Since only four of the sea straits between the Kurils are over 500 meters deep, and of these only two are over 1,000 meters deep, and since, in addition, their breadth is very slight, the exchange of deep water is kept within very limited borders and has as good as no influence in the sense of an equalization of temperature between sea and ocean. In this the bulk of the water layers of the Sea of Okhotsk, which lie more than 1,000 meters deep, cannot be drawn at all into an exchange.

Even though the picture is somewhat confused by the numerous openings and their various current directions, a clear sea current can nevertheless be recognized within the Sea of Okhotsk; this sea current moves counterclockwise along the coast. It enters the Sea of Okhotsk south of Kamchatka Peninsula and moves toward the north along the west coast of this peninsula; in the north, however, it is pushed somewhat off the coast by a cold water stream coming from the north. In Shelekhov Bay the current turns and follows the coast toward the west. This turn in the bay and the slanting stretches following the coast lead to the presence of cold water upwelling /Auftriebwasser/, which is drawn into the general current; this general current then follows the west coast farther, washing up around St. Jonas Island. Strengthened by the influx of water from the Amur, the current then runs along the east coast of Sakhalin toward the south, where it unites with the water stream coming from La Perouse Strait, and then again reaches the Pacific Ocean through the southern gaps of the Kurils. The currents in the middle of the Sea of Okhotsk fit into the framework of the main current described.

Tides appear on all of the Sea of Okhotsk. The tidal wave comes from the Pacific Ocean and enters the area of the Sea of /85/ Okhotsk through the gaps between the Kurils; the tidal wave is strongest in the middle of the island chain and then spreads out almost equally. The range has a mean of 4 meters in the open parts of the coast, but in the interior of the great bays it grows strong and reaches, for example, 11.3 meters in Gizhiga Bay.

The long, cold winter with its raw winds blowing from the 132
mainland causes a marked cooling off of the water; the short and cool 133
summer with predominantly heavier clouding and numerous fogs brings

132
133

only a slight warming up; and accordingly the temperature of the surface water layer rises only a little above 10° in the summer. This seasonal rise in temperature applies, however, only to the water levels to a depth of at most 30 to 50 meters, while the layers lying under this have a constant temperature, which is negative /in Centigrade/. Investigations have shown that the water temperature at first gradually decreases as the depth increases and then with a leap the water temperature reaches 0° already at a depth of 15 meters. Then the temperature lowers only very slowly, reaching -1.5° at depths from 75 to 150 meters. Then follows a slow rise in temperature until the bottom of the sea, where a temperature of 1.2° dominates in the north and one of 2.5° dominates in the southern part of the sea. With the formation of ice and the crystallization of salt, the surface waters can become so thick that they sink toward the depths.

Characteristic of the Sea of Okhotsk are constant cold water zones, which are a permanent phenomenon in certain areas and which give these parts of the sea a special stamp. These cold water zones are related genetically to the current conditions and can be explained as upwellings /Auftriebswasser/. Three such regionsshould be named above all: the one off the Yama Bay in the area of the Yamsk Islands; the one around Jonas Island; and the third in the open sea approximately between the north end of Sakhalin and the Shantar Islands. Within the first two cold water areas mentioned, the water temperature never rises above 1°, and in areas around these places it always remains 3° to 5° below the mean temperature of the sea. Off the entrance to the Penzhina Bay the water temperature even in high summer is never higher than 5° to 6°. The current emptying into the Shelekhov Bay turns here within the bay again toward the exit and draws upwelling /Auftriebswasser/ from the smaller bays toward it; the appearance of the latter off the Yama and also the Penzhina bays is especially striking. From the Yama Bay the cold upwelling stretches toward the southwest and thus in the direction of the general current; in this the upwelling water gradually and partially warms up on the surface or in part also sinks down, but certain cold water stretches are nevertheless recognizable. The sea bottom elevation of the massif around Jonas Island, it is assumed, causes /86/ again the rise of cold water layers, which are very characteristic of the environs of the island. The water is never warmer than 1° in the vicinity of the island and never more than 1° to 3° a bit farther off the island. The cold water zone lengthens from Jonas Island then toward the south, where there is still further

cooling off between the Shantar Islands and the north end of Sakhalin; the cause of this is regarded as the strengthening of the general current by the addition of the water masses of the Amur. 132 133

The cold water zones are noticeable in summer because of the heavy formation of fog, which becomes heavier in relation to the contrast between the air and the water temperatures. For weeks in the summer there often lies over these regions thick banks of fog, which clear up only with bad weather. Nowhere in the Sea of Okhotsk is the fog so constant and so thick as in the area of the Yama Bay and around Jonas Island. The winds contribute to the spreading of the fog, and accordingly it also appears over regions with relatively warm water. But the source of the fog is clearly the cold water areas, where new masses of fog always form. These masses of fog are characteristic for the entire north of the Sea of Okhotsk and hinder sea traffic.

Since the Sea of Okhotsk projects far into the mainland mass of the continent--the low winter temperatures are, of course, known--a solid ice covering forms already in December along the entire coast from the Strait of Tatar in the south to Penzhina Bay in the north. In February the entire northern half of the sea is covered with floating ice, and the ice floes are often shoved together into a closed covering until a storm again tears them apart. Only by the middle of June is the bulk of the sea entirely free of ice. Further discussion of the ice covering and its significance for man is given in the section on sea transportation.

The salt content of the Sea of Okhotsk is slighter than in the neighboring seas and varies between 32 percent and 32.5 percent. The salt content increases with the depth and reaches 33.5 percent to 34.5 percent at the bottom of the sea. 133

The Bering Sea

The Bering Sea is the most northerly border sea of the Pacific Ocean, from which it is separated by the islands of the Aleutian chain. However, the closing between the Bering Sea and the Pacific is not so shut off as is the case with the Sea of Okhotsk, since between the Commander Islands and the beginning of the Aleutian chain there is a connection which is up to 342 kilometers wide and up to more than 3,000 meters deep. Accordingly an exchange of water up to this depth can go on unhampered. The connection via the Bering Strait /87/ /Map of the Bering Sea:/ /88/ to the northern Polar Sea has, on

A part of the entering mainstream of the Bering Sea enters the shelf and with moderate speed draws in a northward direction over the Bering Strait into the Chukchi Sea. This current is reinforced by another Pacific current that presses in over the Unimak Sea strait (west of the island of the same name), immediately contacts the shelf and then flows alongside the west coast of Alaska along with the central current, and then via the Bering Strait into the Polar Sea. The accompanying sketch map serves to orient the reader as to further details on the currents of the Bering Sea.

For the most part the surface water temperature depends upon the general climatic conditions. Located in high latitudes /89/ and situated in between the mainland mass of northeast Siberia and northwest America with their long and servere winters, the Bering must be designated as a very cool sea. In the summer the surface waters along the shelf areas manage to warm up only to a limited degree and then, apart from the warm currents, reach temperatures of only 7 to 9 degrees. The surface water in the deep sea basin is as a rule warmer and reaches a warmth of from 10 to 11 degrees. It is of special significance and worthy of note that the surface waters of the Bering Sea, because of the permanent inflow of warm water from the Pacific throughout the whole year, cause the temperature of the Bering Sea to have a year-round temperature higher than that of the air. A. A. Borisov (39)

39. Borisov, A. A., Klimaty SSSR /The Climate of the USSR/, (Moscow, 1948), p. 122.

has published the following table:

Month	Water Temperature	Air Temperature
January	-1.0°	-3.8°
April	1.6°	-0.9°
June	10.3°	8.5°
October	6.9°	4.3°
Annual	4.7°	2.1°

Because of the exchange of deep waters with the Pacific Ocean, the deep-water temperatures of the Bering Sea are completely different from those of the Sea of Okhotsk. From a summer surface

temperature of 10°, at a depth of 30 to 40 meters, the temperature gradually drops from 4° to -6°. At 100 to 150 meters lies the coldest water level, with a temperature of from 0.5° to 1.0°. Below this depth, at from 200 to 500 meters, the temperature again rises to as high as 3.5° and then gradually drops again to from 1° to 2° at depths from 2,000 to 3,000 meters. The coldest surface water is found in the Olyutorskl and Anadyr' bays. Both are characterized by constantly rising deep waters and especially strong clouding. The cold, southward-flowing current along the east coast of Kamchatka also creates thick fog banks, which are a special feature of the Kamchatka coast.

The salt content of the Bering Sea is, in general, high, reaching 32 percent at the surface and rising at a depth of 3,000 meters to 34.5 percent. It is only in the extreme north that the salt content diminishes, becoming at this point 27 percent, because of the influx of fresh water from the Anadyr' and Yukon.

During the winter all along the coast of the northern part of the Bering Sea, a solid ice sheet forms, in front of which is a broad area covering with floating ice floes, which also cling to the east coast of Kamchatka. The edge of the floating mass of ice runs somewhat south of the rim of the ice shelf and is parallel to the shelf. Off Anadyr' Bay and the entrance to the Bering Strait the floating ice accumulates and becomes thick pack ice. The warm water current causes the ice to melt very early, however. By the middle of May it remains only along the Asiatic coast, /90/ and in June it still remains only at Anadyr' Bay. By July the Bering Sea is completely ice free, and the ice edge recedes back to the Polar Sea.

The Sea of Japan

The Sea of Japan stretches between the Asiatic continent to the west and the islands of Sakhalin, Hokkaido, and Hondo /Honshu/ to the east. It is connected with the East China Sea by way of the Korea Strait (depth: 167 meters), with the Pacific Ocean by the Straits of Tsugaru (106 meters) and Shimonoseki (30 meters), and with the Sea of Okhotsk by La Perouse Strait (55 meter) and the now blocked-off Tatar Strait (8-10 meters). In view of these relatively shallow connections to the neighboring sea areas, the Sea of Japan stamps itself as a clear sea basin, of which more than half is at a depth of 2,000 meters and approximately one quarter has a depth of 3,000 meters. The descent of the sea floor to a depth of 2,000 meters is far more

133 Current and there finds its end. On the way, the cold water current is strengthened by upwelling water, which is noticeable along the coast of the Sikhote-Alin', especially south of Ol'ga Bay, and which is distinguished not only by its greater coolness but also by its higher salt content. Where the cold water current encounters the warm current, a cold water front forms which, however, does not always remain in the same place in the course of the year. In winter the cold current appears to attain a greater strength and moves the cold front to the south, while in summer the cold front again withdraws to the north. (116)

116. Lautensach, H., Korea, (Leipzig, 1945), p. 118.

132 133 Because of the fact that the Sea of Japan extends so far from north to south--the Tatar Strait lies somewhat below the 50th latitude and the Korea Strait below the 35th latitude--the surface water temperatures in the various parts of the sea and in the course of the year are very different. In the area of the Korea Strait the surface water temperature varies between 26° and 14°, in the region of the Tsugaru Strait it varies between 24° and 5°, in La Perouse Strait it varies between 22° and 1.4°, and in the northern part of the Tatar Strait it varies between 17° and -2°.

The temperature of the water sinks very rapidly as the water gets deeper. In July, 1928, in the middle of the sea the temperature at the surface was 20.4°, at a depth of 50 meters it was still 3.4°, and at a depth of 100 meters it was only 0.8°. The last-mentioned temperature remains at depths of 500 meters and more. Nowhere, even at greater depths, has a lower temperature been determined. (205)

205. Suslov, S.P. Fizicheskaia geografiia SSSR /Physical Geography of the USSR/. Moscow-Leningrad, 1947.

133 In winter the Tatar Strait is regularly closed by a solid ice sheet to approximately 50° N. Otherwise such an ice covering is formed only in the bays of the Soviet Russian Maritime Krai; this applies, however, to bays as far as Vladivostok, whose harbor can be kept open during the three winter months only with the help of ice-breakers. Floating ice, however, can be encountered regularly every winter in the northern part of the Sea of Japan as far as a line approximately from the middle of the island of Hokkaido to the Korea Bay.

Tides are noticeable in all the Sea of Japan, but not in great measure. The tidal wave enters the Sea of Japan through the broad Korea Strait but then spreads so quickly that it is observed at practically the same time on all coasts. The range between high and low tide decreases the farther away one gets from the Korea Strait. Thus in Pusan it is still 2.10 meters, at the mouth of the Tumen it is only 0.30 meters, but it rises in the narrows of the Tatar Strait to as much as 2.70 meters.

The current conditions and the various water temperatures affect the neighboring coastal regions in a remarkable fashion. On the mainland side the winters are under continental influence /93/ and bring a high degree of coldness. This applies especially to the Soviet Russian mainland coast and to Sakhalin. As a consequence the appearance of ice off the mainland coast extends farther to the south than it does in the eastern part of the Sea of Japan. Even in late spring the cold current brings in floating ice floes along the coast toward the south. In summer the cold coastal current along with the predominant east and southeast winds temper the air temperatures of the mainland coast. It is the source of the fog forming along the entire coast, especially during the summer; for the thickness and duration of the fog are greater in relation to the temperature contrast between the air and the surface of the water. This applies especially to the sea areas off the Soviet Russian coast, which with southeast winds predominanting are enveloped in thick, cool fogs.

The salt content of the Sea of Japan is greatest in the south where water with a salt content of 34.56 percent enters through the Korea Strait; the salt content is smallest in the Tatar Strait, where it amounts to 31.96 percent. In winter the salt content of the surface water rises and can reach up to 35.0 percent. The reason for this can be found in the slightness of the winter rainfall and in the decreased inflow of fresh water from the rivers.

A distinguishing mark of the Sea of Japan, important for sea transportation, is the frequent appearance of storms, which are especially numerous in spring and fall. They appear in the train of cyclones, which come from the mainland or the East China Sea and make use of the Sea of Japan as a route to the northeast. The number of these storms is not so great in the summer as in the transitional seasons, but they are of greater violence, especially in late summer when equatorial whirlwinds press into this region as typhoons and develop great wind velocities. In winter, on the other hand, the con-

[i.e. in the Sea of Japan--Analyst]

132 tinental cold air front forces the paths of the cyclones toward the south and southeast, and accordingly their activity is limited more to Korea and the eastern part of the Sea of Japan and scarcely touches the Soviet areas.

The World of Plants

137 The vegetation, too, can be divided according to the climatic provinces. However, here the vegetation has not shaped special formations of its own, but rather has a general transitional character. In Transbaykal the Siberian taiga turns into the Mongolian steppe vegetation, and on the Amur and Ussuri typically Manchurian plants extend beyond these rivers and intermix with representatives of the Siberian evergreen woods. Only in the region of the coastal climate have some special forms of the plant world developed which are peculiar to this region alone.

/94/ In Transbaykal the steppe vegetation penetrates very far toward the north. Often it appears in islands in the middle of closed forest regions. In the valley of the Upper Angara we find feather grass (Stipa pennata) and fescue grass /Schafschwingel/ (Festuca ovina) as typical representatives on the southern slopes, while the northern slopes are covered with thick larch and pine forests. In the valley of the Barguzin feather grass and artemisia steppes are spread out not far from one another. Also the well-known Nerchinsk Steppe, better designated, however, as a forest steppe, is an island closed off in itself and approximately 100 kilometers long and just as wide. In general the character of a meadow steppe predominantes here, but in lower areas salt ground appears with numerous xerophilous plants. The steppe, however, attains its greatest area, here closed off, in the southeast between the upper courses of the Argun and of the Onon. This Argun Steppe begins in the north as a meadow steppe and turns toward the south into an artemisia steppe, which already gives the impression of being a semiwasteland. West of the Onon the pure steppe appears only in spots, and only in the Selenga area does it have a significant size. Here, between Novo-Selenginsk and Troitskosavsk /now: Kyakhta/ lie alluvial sands, which are often laid bare and which show an almost wasteland character with wandering dunes /Wanderdünen/ and inlaid Salzpfanne /salt pans/.

The ground relief is of decisive importance in determining the extent of the forms of vegetation in detail. The steppes as a rule re-

/125/ THE ECONOMY

Agriculture

Among the various branches of the economy agriculture stood in the foreground in 1938. Of the entire population 55.8 percent were attached to agriculture; the percentage of those in agriculture in the various regions was as follows: 162

	rural	urban
Buryat-Mongol ASSR	70 %	30 %
Chita Oblast	56 %	44 %
Khabarovsk Krai	55 %	45 %
Maritime Krai	49 %	51 %

In the interval these relationships have changed substantially. The increase in the total population up to 1950 was 35.6 percent, and the bulk of this was in the industrial sector; accordingly the urban, i.e., the industrial population has a majority today in the entire area of the Far East. Among the various regions the Buryat Mongol ASSR has retained its overwhelmingly agricultural character. The same can also be said of the Amur Oblast newly formed in 1948, though this cannot be verified in figures.

The natural conditions for agriculture are completely favorable in the southern parts of the Far Eastern region. All of Transbaykal lies within the 5° May isotherm, and the Amur Oblast is included in the main in the 10° May isotherm. The brief transition from winter to summer lengthens the vegetation period, which is generally sufficient here. The harsh winter, however, limits cultivation, and accordingly summer cultivation predominates. The rainfall causes difficulties. While a heavier rainfall could be desired for Transbaykal, the rainfall in the Amur and Ussuri regions exceeds the amount necessary, and this results in certain restrictions. The great dampness hampers the ripening of the grain in the fields and fosters the appearance of vermin. Water often remains standing on the flat fields and often leads to the rotting of the plants. Accordingly the Russians are forced to give up European flat cultivation /Flachbau/ in favor of furrow cultivation /Furchenkultur/, in which the grain is sown on heaped up earth so that the water collects in the furrows in the ground and can there seep in or flow off /126/. 241 132 241

The method is used with success everywhere in the Far East by the

505 the entire Far Eastern coast. Nature has through winter ice barriers drawn an often very narrow limitation, in terms of time, on the usefulness of the sea route.

132 On the Sea of Japan freezing of the coast and freezing over of the rivers occurs relatively early along the Soviet Russian coast in the entire area north of 42° latitude as a consequence of the cold winds coming from the continent. The harbor of Vladivostok, however, [504] can be used all through the year. To be sure, the "Golden Horn" freezes over in the second half of December, and the ice covering remains until into the second half of March, but the ice is not so thick that a path cannot always be made by ice-breakers for the incoming and outgoing ships. Even here, however, the undisturbed ice can attain a thickness of up to one meter.

Far more unfavorable are the conditions in the Gulf of Tatar, which separates Sakhalin from the mainland. In the southern part the ice distribution and with it the accessibility of the coast depends on the prevailing winds. With persistent northwest winds the ice piles up on the western coast of Sakhalin; with east and southeast winds, on the other hand, the ice is driven toward the mainland coast. North of 51° latitude the ice covering is thicker; there the gulf is covered by a closed ice covering throughout approximately 125 days a year, and passage is free only at the beginning of May. The individual bays, however, on which the coastal towns lie, are closed over earlier and also remain shut off by ice longer. The Amur at Nikolayevsk has an ice covering for a mean of 184 days. The table appended to this chapter gives details on this.[1]

As a consequence of the northwest winds which set in already in September and especially in October, the Sea of Okhotsk comes under continental influence early. At the end of October and in the first half of November ice formation begins along the northern coast. The thickness of the ice grows until into March, persists through April, and only in May does the disintegration of the ice begin. Almost at the same time the breaking up of the ice also begins, at first at the mouths of the rivers and then along the coast. This type of breaking up fosters the destruction of the solid coastal ice, which is then further broken up by the wind and battered by the waves. As a consequence of the current the ice is driven toward the west and southwest and collects in Udskaya Bay and at the Shantar Islands in the southwestern corner of the Sea of Okhotsk. As a consequence of this the ice persists the longest in these places. Even in July large ice fields can be

[1] [cf. pp. 231-232 -- Analyst]

encountered there. Thus the steamer 'Tula' ran into extensive drift-ice fields between the mouth of the Amur and the Ayan between the the 20th and 28th of July, 1916. It /199/ /Sketch Map of the Highest Level of Ice Distribution/could neither get into Uiskaya Bay nor sail toward Nikolayevsk on the Amur and had to return to Vladivostok via La Perouse Strait with its load without having reached its goal. Equally noteworthy is the fact that on January 20, 1940, the merchant steamer 'Igarka' was able to reach Ayan without impediment and without the aid of icebreakers. It was the first attempt at a winter trip in this territory. On the return journey, however, the ship became locked in heavy ice and required the icebreaker 'Krassin' to free it. Apart from the southwest corner and the northwest bays /200/ the Sea of Okhotsk is generally ice-free in June. The bays on the north coast are already completely blocked by solid ice by the end of November. This solid ice covering then grows all along the coast farther into the sea. Penzhina Bay provides one exception to this rule. The formation of a solid ice covering is prevented at Penzhina Bay by a tidal current with a tidal hub /Tidenhub/ of up to 12 meters. Heavy pack ice masses thus collide. The ice lasts both here and in the neighboring Gizhiga Bay until the middle of July.

/132 [505]

The ice conditions appear to be most favorable on the western coast of Kamchatka. The northeast and east winds break up the ice near the coast and drive it into the sea. Even in the middle of winter a strip of ocean is kept open in the vicinity of the coast, while at a greater distance from the shore heavy masses of ice remain fixed throughout the entire winter.

The passages between and the coasts of the Kurils, which lie between Kamchatka and the Japanese Hokkaido, are stopped up with drift ice from January to the end of March when the winds are from the west and northwest, but otherwise they are passable: the farther to the south the easier the passage. Often drift ice between the southern Kurils is driven out far into the Pacific, where drift ice can be encountered in May and even into June if the winter has been especially harsh.

The eastern coast of Kamchatka, in so far as it belongs to the Pacific Ocean, has no ice formations which interrupt ship traffic. To be sure there is drift ice everywhere, but this collects into larger masses of pack ice only on the sand banks in the vicintiy of the coast. Solid ice forms in the bays--for example, in Avacha Bay, on which Petropavlovsk, the capital of Kamchatka, lies. However, the ice

3: Thiel-227 K-4,5(no date) 1953 RRI Siberia RRI

Sketch Map of the Highest Level of Ice Distribution:

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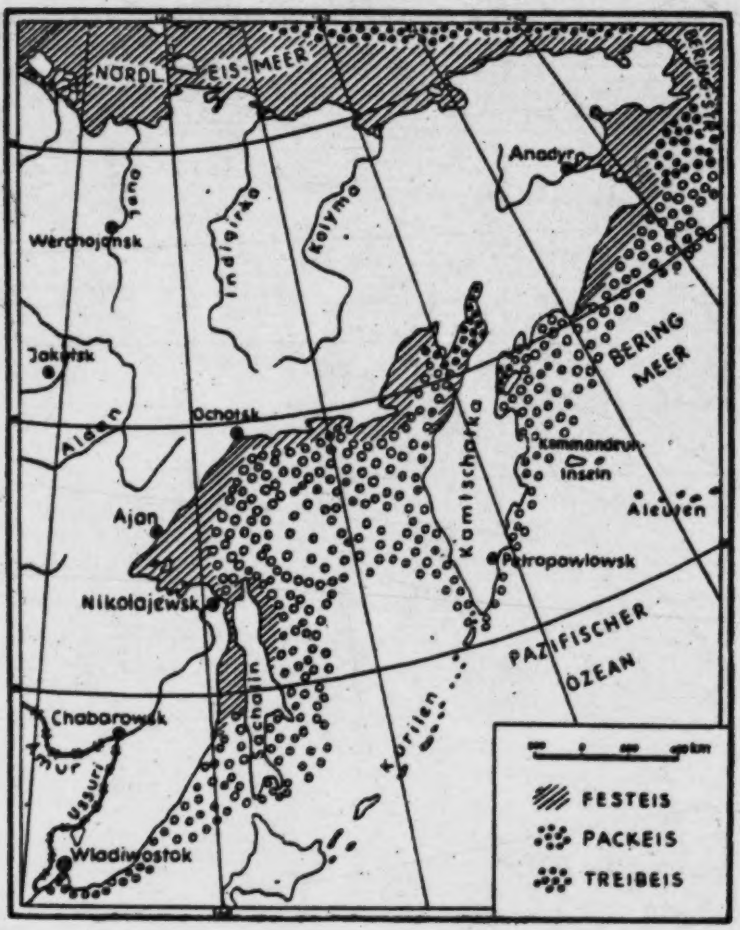

Solid ice
Pack ice
Drift ice

132 covering, which lasts here from the middle of December to the beginning of April is not thick, and it can be kept open at all times with the help of icebreakers.

In the Bering Sea the ice difficulties along the coast increase toward the north. Heavier solid ice forms in the bays and on the coast, the drift ice lasts longer and increases in thickness and strength. Litke Strait between Karaginskiy Island and Kamchatka is stopped up with drift ice from the end of December to the middle of May, but between the mainland and the island it freezes over only very rarely. This was the case in 1918-19, and, accordingly, the Koryak population of the island could reach the mainland with their herds via the ice covering at the beginning of March, when the shortage of fodder for their reindeer was too great. Korff Bay, on which coal is mined, is closed by ice from the beginning of December to the end of April. The coast between Olyutorskoye Bay and the Anadyr' Gulf as a rule has a belt of solid ice and pack ice stretching out in front of it from November to May. The Anadyr' Gulf itself freezes over in the second half of November and remains closed until the beginning of May. Drift ice lasts still longer. In Provideniya Bay the first ice appears already /201/ in September, but only at the beginning of November does the solid ice covering close up. In the course of the winter this ice covering reaches a thickness of 3 to 4 meters.

In the open part of the Bering Sea in the north light drift ice appears already in mid-October. According to the reports of American whalers, a solid ice covering forms around St. Lawrence Island at the end of December. Drift ice has been determined here until the end of July. In the southern part of the Bering Sea there is seldom impeding ice. In the sphere of the Commander Islands the sea as a rule does not freeze over. In the northern part of Bering Sea the movement of ships is generally possible from the end of May to the middle of October; in Bering Strait, however, it is possible as a rule only from the middle of June to the beginning of October. In the beginning of November the sea in the area of the Bering Strait is covered with heavy pack ice. According to some reports, the sea between Cape Dezhnev, the Diomede Island and Cape Prince of Wales is so extensivley frozen over from February to March that traffic over the ice is possible between the Chukchi Peninsula and Alaska.

Ice conditions in the northern part of the east Siberian coast are most favorable for shipping in August and September. The western part of the Chukchi Sea and the eastern part of the East Siberian

Sea--i.e., the regions on both sides of the Long Strait--generally offer the greatest difficulties for shipping. Ice formation sets in the end of September to the beginning of October, beginning first in the areas near the coast, where the salt content of the [illegible] water is lowered by the rivers emptying into the ocean. From the coast the ice then grows out into the sea, forming an uninterrupted ice covering by the end of November to the beginning of December. This solid ice stretches in winter to approximately the line where the ocean becomes 25 meters deep, and, accordingly, the width of the ice fluctuates considerably depending on the depth conditions. At the new Siberian Islands the ice extends from the coast out into the sea beyond these islands and, being 350 kilometers and more wide, it attains here the greatest width in the Arctic. Approximately the beginning of April the first signs of the breaking up of the ice appear. In May and June there is an active formation of splits. As the season progresses the great ice fields become smaller and smaller and finally become ice floes, between which a ship can go. The farther to the east one goes the later the breaking up of the ice begins; in the Chukchi Sea it usually does not begin until July. The deeper parts of the North Polar Basin are covered with Arctic pack ice, which toward the end of winter has a thickness of 3 to 3.5 meters. In the course of the summer this sinks to 2 to 2.5 meters. Through tidal currents, surface currents, and the effects of the wind, strains and pressings occur, which lead to a pressing together and with this to the formation of pack ice, whose height in places can reach 10 meters and more. Since the water movement on the shelf as a rule is toward the east, while over the deeper water the movement is directed toward the west, holes in the ice often appear in the border zones, forming here large splits, which at times can be traveled through. These split zones, which are called "polynia" (= ice-free places) by the Russians, /202/ extend from west to east through the entire Arctic part of the sea. In the Chukchi Sea it often appears right on the coast. With a north wind these ice-free areas disappear completely. The Arctic pack ice then grows together with the solid ice of the shelf. If the wind changes suddenly, then the pack ice is driven toward the north, and the polynia arrises anew.

As the attached table shows,[1] ice conditions in the entire coastal area of the Soviet Far East vary greatly from year to year and even change a great deal within a single year. A well expanded network of meteorological observation stations, along with an ice information

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[1] [Cf. catalog, pp. 231-232 -- Analyst]

•132 654 service and help from ice-breakers, could very much expand the usefulness of the parts of the sea threatened by ice. And here the Soviet government has accomplished excellent work worthy of recognition.

505 The center of all the coastal traffic is Vladivostok, from which all lines start. Sea traffic is most active in the most southerly part of the coast as far as Nikolayevsk on the Amur. However, the more northerly localities are also visited regularly several times a year. The longest line leads to the mouth of the Kolyma, whence a trip by one or even several steamers at the same time is undertaken every year. Of the 2,021,000 tons of goods turned over in the harbor of Vladivostok (1935), 864,000 tons came from coastal traffic.

The following figures on distances may explain transportation conditions:

Coastal Steamer Lines

Distances from Vladivostok

Sovyetskaya Gavan'	1,075 kilometers
Aleksandrovsk on Sakhalin	1,335 kilometers
Nikolayevsk on the Amur	1,575 kilometers
Okhotsk	3,210 kilometers
Petropavlovsk	2,785 kilometers
Anadyr'	4,640 kilometers
Mouth of the Kolyma	5,200 kilometers

(Next table on following pages)

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/205/ B. SPECIAL SECTION

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/207/ THE PROVINCES

General Division

133 As the general survey has already shown, the geographical conditions of even a large division of the entire region fall into 1

1 [Ct. cat. 133, p. 232 for continuation — Analyst]

/203/ Dates on the Freezing Over and the Opening Up of the Sea on the coasts

	Final Establishment of the Ice		Final Becoming free of Ice		Mean number of Days with Ice*
	Earliest	Latest	Earliest	Latest	
I. Sea of Japan and the Gulf of Tatar Bay of Peter the Great					
At Cape Gamova	19 Jan.	18 Feb.	3 Mar.	29 Mar.	72
At Askol'd Island	19Dec.	3 Feb.	26 Feb.	24 Mar.	59
Golden Horn	10 Dec.	30 Dec.	15 Mar.	24 Mar.	90
Amur Bay	18 Nov.	30 Dec.	11 Apr.	28 Apr.	130
Ussuri Bay	27 Dec.	15 Jan.	14 Mar.	30 Apr.	85
Sea at Cape Povorotnyy	1 Feb.	4 Feb.	26 Feb.	14 Mar.	--
Ol'ga Bay	17 Dec.	4 Jan.	27 Mar.	12 Apr.	100
De Castri Bay	16 Nov.	15 Dec.	25 Apr.	21 May	152
Gulf at Cape Pronge	24 Oct.	22 Nov.	30 Apr.	29 May	185
Amur at Nikolayevsk	30 Oct.	27 Nov.	10 May	25 May	184
II. Sea of Okhotsk					
St. Nikolaus Bay	5 Nov.	17 Dec.	27 May	25 July	190
Shantar Islands	10 Nov.	81 Dec. /sic/	25 May	20 July	174
Udskaya Bay	20 Nov.	18 Dec.	27 Apr.	10 July	178
Sea at Ayan	25 Nov.	22 Jan.	20 May	26 Feb. /sic/	164
Sea at Okhotsk	27 Nov.	26 Jan.	19 Mar.	18 May	117
Yamskaya Bay	12 Nov.	18 Dec.	21 May	28 June	185
Gizhiga Bay	27 Nov.	30 Dec.	25 May	2 June	136
Penzhina Bay	9 Nov.	12 Dec.	5 May	2 July	188
III. Bering Sea					
Avacha Bay	20 Nov.	7 Jan.	10 Mar.	9 May	115
Side bay of Avacha Bay	19 Nov.	16 Dec.	11 May	5 June	170
Ukinskaya Bay	14 Nov.	8 Jan.	15 Mar.	22 June	128
Korff Bay	15 Nov.	30 Dec.	18 Apr.	16 June	160
Olyutorskiy Bay	25 Nov.	30 Dec.	10 Apr.	10 June	149
Dezhnev Bay	8 Nov.	25 Dec.	29 Apr.	15 June	170
Anadyr' Gulf	12 Nov.	5 Dec.	29 Apr.	9 July	190
Holy Cross Bay	30 Oct.	18 Dec.	25 Apr.	18 July	195
Provideniya Bay and Emma Harbor	24 Oct.	26 Nov.	2 June	16 July	220

(table continued on following page)

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	Final Establishment of the Ice		Final Becoming free of Ice		Mean number of Days with Ice*
	Earliest	Latest	Earliest	Latest	
Cape Chaplin	27 Oct.	8 Nov.	20 June	15 July	240
Sea south of Markovskaya Bay	25 Oct.	28 Nov.	12 June	27 July	230

* The mean number of days with ice includes drift ice and established ice.

133 individual natural areas. In the following consideration these natural areas are again divided into individual provinces, with the relief serving as the principal basis for the division. Given the size of these individual provinces it is obvious that in addition to many common traits in a given province there are also differences in the individual parts of the province. Accordingly, a further subdivision could be carried out without difficulty. However, this has intentionally been forgone for reasons of clarity.

The varying treatment of the individual provinces and their parts is a consequence of the uneven knowledge of many parts of the land. In going through the Russian literature, one can again and again determine that in addition to well-known regions there still exist extensive areas which require exact investigation. In contrast to the individual research prevailing in the Czarist period, Soviet Russian science has gone over more to a systematic penetration. However, with the great size of the entire land, much still remains to be done.

Transbaykal is divided by the Yablonovyy Ridge into two provinces: according to Obruchev, these can be designated as the western or Baykal province and the eastern or Nerchinsk Daur province. Toward the north the individual mountain ridges come together to form extensive plateau areas. To this category belongs the Vitim Plateau, which is grouped as a unit with the mountain forest areas adjoining it to the north and equipped with an equally raw climate. The mountain country between Vitim and Olekma and the Olekminsk Stanovik contitute the transitional area to the actual Amur country. Here the Zeya and Bureya mountain country marks the border of the economically important Zeya-Bureya plain. Again accompanying the lower Amur is a depression, which flows together with the Amgun area. The Sikhote-Alin' and the Ussuri-Khanka depression constitute individual

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provinces of the Ussuri country. The division of the remaining regions follows of itself: the island of Sakhalin, the region of the Amgun and Uda, the Okhotsk coastal country, the provinces of the extreme northeast and of Kamchatka Peninsula (see map). A short survey of Lake Baykal precedes the description of the provinces.

/208/ Lake Baykal

Adjoining Transbaykal on the west is Lake Baykal, which belongs among the most interesting lakes in the world. It has a water surface of about 23,000 square kilometers, a length of 636 kilometers, and its greatest width is 79 kilometers. The smallest width, between the mouth of the Buguldeyka and the delta of the Selenga, is only 25 kilometers. The lake lies on the mean at 453 meters above sea level, but the lake floor sinks down 1,741 meters, thus reaching 1,288 meters below sea level and so making Baykal the lowest internal lake in the world. The mountains right on the shore rise more than 2,000 meters, and, as a result, there are height differences of more than 3,700 meters within a very small area. From this the tectonic formation of the lake can also be recognized. This occurred through the inroads of four grabens shoved approximately toward one another; of these grabens, the most southwesterly one runs in the Sayan direction and the others, on the other hand, run in the Baykal direction. This explains the long swung, arc-shaped form of the lake basin. In terms of time the formation of Lake Baykal was related to the graben breaks of Transbaykal and must have occurred after the middle Tertiary. The lake acquired its present form and shape in the time between Pliocene and Quarternary.

The temperature of the water is extraordinarily cool, and even in August, which brings relatively the highest temperatures, it never exceeds 9° to 10°. In the vicinity of the shore the surface water is somewhat warmer, and only in some bays, which are favorably located, does the water temperature rise to 15° to 19° at the highest. From a depth of 255 meters on the water temperature remains approximately constant at 3.5°. At a depth of 900 meters a temperature of 3.4° has been recorded, and at 1,600 meters one of 3° has been recorded. The frequent, very violent storms are primarily responsible for the coolness of the surface water. These storms again and again stir up the water, but, on the other hand, they also see to it that Lake Baykal freezes over only at the beginning of January. As a mean established

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133 over long years, Lake Baykal remains for 116 days under a solid ice
•132 covering, which can attain a thickness of up to 1.25 meters.

The fauna of the lake[1] is peculiar, representing a true collection
136 of endemic forms. Of the 1,000 types determined so far, around 75 percent are endemic. Here in the middle of the continent there is a type of seal called "nerpa" by the Russians (Phoca sibirica), which is related both to the same type found in the Arctic Ocean (Phoca hispida) and also to one found in the Caspian (Phoca caspia). The next fauna worthy of mention is the small, viviparous spider fish (Callionymus baicalensis), whose family (Comephoridae) is peculiar only to Lake Baykal. Exceedingly large is the number of mollusks. To date 85 types have been determined, of which two endemic families of brachiopods (Benedictiidae and Baicaliidae) are typical fresh water representatives. The great age of the Baykal fauna, which must have followed an isolated development, indicates the /209/ /Sketch Map of the Provinces://210/ appearance of the Baicalia mollusks already in the fresh water deposits of the lower Cretaceous in Transbaykal.

505 As a result of its depth and its favorable natural landing places, Lake Baykal offers the best opportunities for water transportation. A steamer line which is traveled regularly, connects all the larger settlements with one another and also serves the transportation of goods. Wood constitutes the bulk (40 percent) of the goods transported, in second place are stones and building material (30 percent), then follow fish, salt, flour, and others. The wood as a rule is floated down the rivers to the lake and then is transported by steamer tugs to the mouth of the Angara, where it is transferred to the railroad in Baykal station, which is equipped with mechanized loading equipment, or a small part of it is floated directly to Irkutsk. Wood is delivered on the Transbaykal side primarily by the river areas of the Barguzin and the Upper Angara.

228 Also of economic significance is fishing, which is pursued both in the open sea and also in the bays. The principal role in this fishing is played by the catching of a type salmon, the omul (Coregonus omul Pall. or Coregonus migratorius), and of fish related to the omul: these fish constitute 58 percent to the catch. In second place are types of carp (22 percent), which are caught primarily in the lagoons and in neighboring lakes. Also the catch of seals, already mentioned, is not insignificant. In 1948 there were 1,380 animals caught. Fishing is pursued both by the state and also by fishing kolkhoz. The latter caught 68 percent of the total catch in 1949, while the state was

[1] [i.e. Lake Baykal -- Analyst]

133 area of the Suyfun.

The Ussri comes from the southern part of the Sikhote-Alin' and arises from two source rivers: Daubikhe and Ulakhe. It flows first entirely in Russian territory, and, at the mouth of the Sungacha, which comes from Khanka Lake, it reaches the Manchurian border from where it then serves as the border river until it empties into the Amur. On the mean it is more than 420 meters wide in the lowland and flows languidly in a winding course with a mean velocity of only 1.5 kilometers per hour. The lower course of the Ussuri is often divided into several arms and becomes more than 1 kilometer /266/ wide. Numerous shallows hamper shipping, but the Ussuri is regularly traveled as far as Iman, where the steamer landing place is connected with the Ussuri Railroad by a railroad branch which is 1.5 kilometers long. Under favorable water conditions the Daubikhe is even traveled for a length of 100 kilometers as far as the locality of Lazarevo. However, the flow of water is generally very irregular, and also the summer high water changes greatly. Fluctuations in the water level occur, in which there is a difference of 10 meters between the extremes. Larger downpours of rain often cause the river to rise very rapidly, and thus unforeseen floods occur and cause much damage. The figures of Berg (27) show what great quantities of water can come

27. Berg, L. S. Landshaftno-geograficheskiie Sony SSSR /The Landscape-Geographical Zones of the USSR/, Part I. Moscow, 1931.

down in such violent downpours of rain as are usual during the summer monsoon. While in Voroshilov, the former Nikol'sk-Ussuriskiy, the normal mean rainfall for September is 105 millimeters, a single, mighty downpour of rain in one day brought the rainfall for that September to 115 millimeters. On August 9-10, 1927 in the same place 122 millimeters of rain fell within 22 hours during a cloudburst, which was connected with a typhoon-like storm. [132]

The Ussuri depression extends on both sides of the entire course of the river, and in the north the depression melts into the Amur plain. The Manchurian side appears in this respect to be disfavored in comparison with the Russian side. The Manchurian side lies lower, and its swampiness extends over a much greater area than that of the east side. But here, too, a zone, which is exposed to floods, which is very swampy, and which is little suited to agriculture extends along

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the Zeya and Bureya. Also the soil both in the Ussuri depression and also in the Khanka lowland is similar to that of the Amur prairies. Here, too, it is not black earth, as is still often reported; rather there is in the main muddy moor soil in the vicinity of the lake; this in turn is surrounded by a broad zone of semi-marshy meadow soil, and following then is weak podsol earth. The last two zones are cultivated almost everywhere, and the soil there can in every respect compare with black earth in terms of its yield. The zone of settlements, therefore, begins to the east and southeast of Khanka Lake but at some distance from the lake. If here, as in the Ussuri region, agriculture has to struggle with difficulties, the reason for this does not lie in the soil but rather in the climatic conditions, above all in the heavy summer rainfall. The winter is very cold and brings only a very thin covering of snow, and thus the ground freezes to great depths. Berg (27) states that at Voroshilov the ground freezes to a depth of up

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27. Berg, L. S., Landshaftno-geograficheskie Zony SSSR /The Landscape-Geographical Zones of the USSR/, (Moscow, 1931), Part I, 1. 372.

to 1.8 meters and at Grodekovo the frost even penetrates to depths of up to 2.4 meters. The planting of winter grain is, therefore, not advisable, nor is the planting of clover and lucerne advisable. The cultivation of winter crops is, therefore, always a risk. Further toward the south, in the Suyfun depression, winter rye is cultivated without danger. As a consequence of the deep penetration of the frost, the ground thaws out only late in the year. There is, however, no permafrost in the entire Ussuri region. The planting of summer wheat begins in mid-April to May, and the harvest begins in mid-August. Oats are sowed two weeks later, but are harvested at the same time as the wheat. The sowing of millet is done still later; the harvest, however, occurs only in the middle of September. The shortness of the time between the sowing and the maturity indicates the generally favorable conditions for the flourishing of the vegetation. The European types of grain suffer now under the dryness and under the strong winds during the sowing period, while during the summer they suffer from the great dampness, which makes fructification in the blooming period uncertain when it rains and which also endangers the maturing at harvest. All the better do the native cultivated plants /269/ flourish. With appropriate methods of cultivation European

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these the wood industry should be mentioned in first place. It is concentrated above all in Shkotovo (approximately 10,000 inhabitants) and Tigrovka (approximately 5,000 inhabitants), both of which lie on the railroad line to Suchan. The wood industry is also concentrated in Okeanskaya (approximately 2,300 /277/ inhabitants) to the north of Vladivostok, where a large wood factory delivers veneer wood for export.

The industry in Vladivostok, like industry generally in the southern Ussuri country, is based on coal, which is on hand here in rich measure. Besides the various smaller coal mining localities, Artem and Suchan should be mentioned here as the principal localities producing coal. Already by 1938 the coal mined in Artem exceeded that mined in Suchan by threefold, and since then coal mining in Artem has been very much further increased. To Artem belong also the two coal districts, Ugol'naya and Trudovaya. The new railroad line, which leads along the western coast of the Bay of Peter the Great to Pos'yet and Kraskino, connects the most important coastal localities, which above all pursue the catching of fish. In the same region there are some sovkhoz for breeding stags at Peschanaya, in Krabbe, and on the Gamova Peninsula.

Sakhalin Island

Sakhalin came to Russia through the treaties of Aigun (1858) and of Peking (1860). However, until 1871 Russia had to share possession of the island with Japan, which in early times had already erected numerous factories in the southern part of the island. Through the unhappy Russo-Japanese War, Russia lost the southern half of the island to Japan. The fiftieth latitude was determined as the boundary line. The outcome of World War II brought the Soviet Union again in possession of the entire island.

Sakhalin covers 80,000 square kilometers and stretches from north to south in an almost meridional direction for about 1,000 kilometers. Once feared as a prisoners' colony of the Czarist empire, the island is notorious for its raw climate. The famous Russian writer A. Chekhov writes, "Sakhalin has no climate at all; the weather is eternally bad and gloomy." The island owes this unhappy reputation to the influence of the cool Sea of Okhotsk, to which the bulk of the island is fully given over. The greatest part of the island is covered with thick forests, which recall the taiga of Siberia. Along the coast

133 appearance of a large mountain river. The high banks already here have good larch forests. In the area around the upper course of its left tributary, the Belaya, which comes from the Anadyr' Mountain Range in the north, there are supposed to be, on the other hand, only poplar forests and no larches. Above Markovo, the principal locality in the interior of the region, the wide plain begins. At Markovo, more than 500 kilometers from its mouth, the river lies only 25 meters above sea level, and thus the drop from here on is very slight. The middle course of the river, therefore, extends over a width of up to 1.5 kilometers and includes numerous islands. The depression, especially the central parts on both sides of the river, traverse wide, lightly hilly, moss-covered swamp areas with numerous large and small lakes and river courses with water which scarcely flows. There are
[131] no forests at all in the depression. West of the Belaya and to the southwest of the basin, the swamp areas here and there still have bushes of alders, poplars, and willows, but toward the east this, too, disappears, and here the landscape picture appears monotonous and can be surveyed over a vast area. Also the spurs of the mountain range and the ridges are mostly flat and covered with a slimy moss covering. Often the mountains still have lakes and brightly iridescent swamp areas on their ridges.

131 To the north of the Anadyr' depression, as was already mentioned with the Belaya, only poplar forests occur in protected places. Larches are generally rare there. Only south of the depression do they also /293/ appear. In the west, on the other hand, i.e., more removed from the damp-cool influence of the sea, larch forests penetrate into the valley areas and onto the slopes much farther to the north. The transition from the depression to the mountains occurs in the same way almost everywhere. As a rule, poplars and willows, but rarely birches, set in first on the river courses, and, widening into a type of gallery forest, these trees accompany the river even into the mountain range. For this the trees take up the valley bottom, while the slopes are already traversed by coniferous forests. The slopes exposed to the winds and the higher ridges, however, are without forests.

• 132 The fact that the Anadyr' depression opens onto the sea permits the influence of the sea to penetrate far into the land. In the west temperatures of -50° are no rarity, while that degree of coldness appears only as an exception in the east. In summer, on the other hand, the coast is cool and rainy, while in the west there are very warm days. The cool fog which envelopes the coast in summer almost never penetrates into the land, however.

133 andesite type (172). Not far from the last volcano mentioned, the

172. Savritskii, A.N. Piat' let geologicheskikh isledovanii Kamchatki /Five Years of Geological Research in Kamchatka/. Problems of Soviet Geology, 1935.

mighty but quiet Koryatskaya Sopka rises to a height of 3,457 meters, and next to it is the Sopka Zhupanova (2,929 meters). South of Avacha Bay the mountain range has many valleys because of the rivers streaming off radially in all directions; but down to the southern tip of the peninsula smaller extinguished and active volcanos lie on the mountain range. The height of the mountains here rarely exceeds 900 meters. The last group of volcano mountains, with the Ilinskaya (855 meters) and the Kambal'naya Sopka (1,615 meters), rises over an extensive region of mountains, which are gently inclined and like ruins, in the extreme south around Kuril'skoye Lake, which is 306 meters deep and which represents an old crater.

312 Related to the phenomenon of volcanos is Kamchatka's wealth of warm mineral springs. Of these the Nalychevkiye springs between Avacha Bay and the Sopka Zhupanova are worthy of note. These springs come from an andesite layer with a temperature of 72°, and they contain a great deal of borium and arsenic, which is deposited in terraces. Interesting pictures develop in the winter when the steam rains down in the environs and forms fantastic ice figures.

133 The east coast, in contrast to the west coast, is richly divided up by inroads. The projecting peninsulas mostly end with a steep, rocky descent to the sea. The bays, on the other hand, have a broad, flat, treeless strip, which has its greatest size at Litke Bay. Avacha Bay, too, on which Petropavlovsk lies, is surrounded by a coastal plain, which, however, is narrower here.

[30] Enclosed by the high lines of mountain ranges, which protect it from the damp, cold, foggy, snowy, and rainy climate of the coastal sides, the central Kamchatka valley is distinguished by a more continental /298/ climate, which, dispite the harsh winter, is found more pleasant by man than the constantly damp coolness of the coast. The river valley itself is swampy but it is accompanied by a grass steppe, occupied by a spotty stock of birches. This grass steppe offers good conditions for breeding livestock and is not unfavorable even for agriculture. After the break-through to the east the Kamchatka River ends in a wide, treeless delta, which has a special economic significance because of

with islands.

361 The main locality on the west coast is Bol'sheretsk. It is the
228 center of the crab and salmon fishing industry. All the catches of the numerous fish collection points flow in here for processing. The main fishing regions stretch from Cape Subchatyy to the southern tip of the peninsula, i.e., more in the southern half of the coast. Further to the north lies Palana, the cultural center of the Koryak.

371 In the future development of Kamchatka, exploitation of the natural resources will play an important role. The supplies of coal and oil have already been treated in detail in another place, and thus only a mention may be sufficient here. Also water power rich in energy is available here. Up until now only small water-power stations for supplying agriculture have existed, although there are also vast possibilities here. Thus Kamchatka shows a relatively favorable picture of its economic development to date with further good prospects for the future.

Commander Islands

133 Approximately 250 kilometers east of Kamchatka there arise alone from the sea the Commander Islands. They are separated from the peninsula by a sea channel which is 1,000 meters deep, while toward the Aleutians the floor of the sea sinks down deeper. The island group, which covers 2,150 square kilometers, consists of two large, inhabited islands, Bering Island and Copper Island, and of two small islands, on which only large numbers of sea parrots and aras make their home. The islands are of volcanic origin and consist principally of andesite tuff and basalt.

Bering Island forms in the north a flat, low-lying moss steppe, while a wild highland traverses the southern part. This highland pro-
132 jects up to 670 meters. The damp, cold, constantly foggy and rainy weather (coldest month -4°, July +11°, annual rainfall 500 millimeters) and heavy storms permit only a crippled growth of mountain ash and
137 willows to come up. The islands lie at the latitude of Moscow. All the more luxuriant is the growth of grass; the Hercules types, which grow to more than the height of a man, are especially striking.

133 Copper Island received its name from the copper enclosed in the volcanic stone. It is formed from a mountain ridge, which is divided into two parts by a land narrows and which descends steeply to the sea. The mountain ridge is broken up by several cross valleys.

tumble down and form true "rock seas" at the foot of the mountains. The river valleys are deeply etched in the mountain massif and extend from the highest elevations radially to the sea. Often they end in bays, which are filled with deposits and thus afford favorable opportunities for man to go onto the land. In many cases, on their way to the sea these rivers have dug deep, narrow gorges in the volcanic stone; but often because of the elevation, the rivers have not had time to sink down to the level of the sea. Thus they tumble into the sea as a waterfall at the steep break on the coast.

The climate of the Kurils is raw and brings a cold, long, and relatively dry winter and a cool, damp summer. The climate stands completely under the influence of the monsoonal circulation of air. In winter northwestern winds prevail (70 percent); they have great strength (the monthly /307/ mean velocity of the wind is 14 meters per second) and there is slight relative humidity of the air (60 percent). In summer southern and southeastern winds prevail, but they generally are weaker than in the winter and are often interrupted by calms. The relative humidity of these winds reaches 90 percent. At the end of the summer and in the beginning of the fall very heavy winds, which can attain a velocity of up to 74 kilometers per hour, appear as spurs of southern typhoons. The fluctuations in temperature are not very great (21° to 23°), the mean temperature in the coldest month lies between -5° and -7°, and the mean temperature of the warmest month lies between 14° and 17°. The number of frost-free days is 120 in the north and increases to 180 days in the south. The rainfall ranges from 750 millimeters to 1,000 millimeters, and in the course of the year it has its maximum in August/September and its minimum in January/February. Only approximately a third of the days are without rainfall. Snow begins to fall already at the end of October and lasts on the northern islands until the beginning of May. The snow covering reaches a thickness of 100 centimeters. The cloudiness is very heavy. On many islands only 15 to 30 clear days have been observed in a year. The most beautiful season is the fall, which has the most still and rain-free days. Characteristic phenomena of the Kurils are the numerous thick fogs, which appear primarily in the summer and arise when warm-damp air masses from the Pacific move over the cold Oyashio /Okhotsk Current/. The fogs, as a rule, do not have great thickness, and thus the peaks of the mountains often lie in the sunshine, while all the rest of the island is enveloped in thick fog. The fogs are an extraordinary hindrance to shipping and bring many dangers. From

December to the end of April shipping must be stopped completely as a consequence of the ice covering in the area of the islands. Even the most southerly island, Shikotan, is cut off from all traffic with the outside world during this period.

Because of the great stretch of the islands from north to south, vegetation on the Kurils has developed very differently. Of the 768 types of flora established to date on the Kurils, 257 have the base of their development in Japan, and only 45 have the base of their development in Kamchatka and the adjoining mainland. On the northern island tundra vegetation predominates with widely diffused bush covering of Pinus pumila, willow bushes and birch bushes. Trees can develop only in some few protected places. The central islands have the poorest vegetation: these islands mostly are also small and of lesser height, and thus the rawness of the cool sea current can have the strongest effect on them. The southern islands have a relatively rich vegetation. Here (Uruppu, Etorofu, Kunashiri, Shikotan) there already appear forests which are rich in wood and have trees with long trunks. In these forests firs (Picea jezoensis, Picea glehni) and the Sakhalin spruce (Abies sachalinensis) predominate. Mixed in with these trees are oaks (Quercus grosseserrata, Quercus /308/ dentata), beeches (Carpinus cordata), and other deciduous trees. In higher places and in the vicinity of the coast there appear meadow-like grass areas, which occasionally lend an Alpine note to the landscape picture.

Land animals are slight in terms of the number of types. The brown bear and the wolf are in relation to the distribution of the forests. Very numerous are foxes of all types.

The bird world is extraordinarily rich. In this respect the smaller islands above all are distinguished. Migratory birds are rare. They prefer the Sakhalin route for their wanderings. The real wealth of the Kurils are the fish and aquatic mammals, which undoubtedly are poor in terms of the number of types represented but appear in unusual quantities. Among the fish the same types of salmon should be named as were mentioned in the discussion of Kamchatka. Seals stand in first place among the sea mammals, but sea lions and whales also occur. The valuable sea otter has been almost completely exterminated.

The number of permanent inhabitants of the Kurils was around 13,000 before World War II; in the main they were Japanese. Kuril Ainu--the original inhabitants--numbered only several hundred. The